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Smart Cities and Sustainability: A New Challenge to Accountability?

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SMART CITIES AND SUSTAINABILITY: A NEW CHALLENGE TO ACCOUNTABILITY?

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ABSTRACT

From 1800 to today, the global population has shifted from only three percent living in an urban environment to well over fifty percent in 2020. As a result of urbanization, cities around the world struggle to manage traffic and waste, efficiently distribute utilities, and lower pollution to slow the progression of global warming. Smart city technologies have emerged as a tool to process cities' various forms of data collected through networks of precisely placed sensors and map solutions to many of the environmental and social issues created by urbanization. For swelling metropolitan areas in the United States, China, and Europe as well as in developing countries like Kenya and India, the allocation of control over smart city technologies in private hands provides the necessary technical expertise and funding to make cities smarter and, therefore, more sustainable.

However, smart cities gain insight of smart technologies at a cost. The question is whether this cost is clearly understood. An obvious cost is the loss of privacy, which is receiving much attention at academic as well as political levels. Another less obvious, but not less important, cost is the challenge to establish clear lines of accountability for decisions based on smart city technologies. Public mistrust in ubiquitous technology capable of surveillance is inextricably linked to transparency, critical in democratic systems. The question is whether these risks are necessary to achieve greater sustainability.

This Article reviews the sustainability claims that smart cities promise while highlighting the issues raised by the privatization of large data collection, the exposure of personal data, and the datafication of citizens from the perspective of accountability. The Article will conclude

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with some observations on the challenge of establishing accountability in the context of smart cities governance.

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INTRODUCTION

The growth of cities, especially metropolises, across the globe is—if only in part—managed through urban planning. The objective of urban planning is to create sustainable metropolitan spaces by responding to urban change, by mediating between public and private interests, and by fostering the government's ability to deliver on society's expectations.[1]

The idea that planned urban spaces are capable of improving the physical areas and social structure of the communities that inhabit them is not a new one. In Western history, it dates back, at the very least, to Hippodamus of Miletus (498 B.C.–408 B.C.)—considered the father of urban planning—but there is evidence of earlier manifestations, especially in Asia Minor.[2] The ideal of the Greek *polis* was intended to reflect

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[1] YVONNE RYDIN, WHY PLAN?, THE PURPOSE OF PLANNING: CREATING SUSTAINABLE TOWNS AND CITIES 8 (2011).

[2] *See* Graham Shipley, *Little Boxes on the Hillside: Greek Town Planning, Hippodamos,*

not just practical use of the urban spaces, but also to reflect the normative objectives of equality and democracy.[3]

From 1800 to today, the global population has shifted from only three percent living in an urban environment to well over fifty percent in 2020.[4] Cities lure residents with promises of higher-paying jobs, lower poverty rates, better access to education, and overall higher living standards.[5] However, in recent decades cities have also become synonymous with urban sprawl, excessive energy consumption, and pollution; all of which contribute to the negative impact on the environment. "While [cities] house fifty-five percent of the world's population on only two percent of the Earth's surface, cities consume seventy-eight percent of the world's energy and produce more than sixty percent of the world's greenhouse gases."[6]

Although cities offer great opportunities, their inhabitants' preference for living in low-density areas is one of the key drivers causing cities to sprawl.[7] Most cities have land-use regulations that control building heights, restrict increases in urban waste, and zone neighborhoods for specific uses.[8] These regulations, as well intended as they may be, have almost uniformly been drafted on a piecemeal basis and have caused regulatory costs as well as costs to the economy.[9]

The impact of cities on the environment is grim.[10] However, over the last few decades, "smart cities" have emerged as a modern answer to

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and Polis Ideology, THE IMAGINARY POLIS: SYMPOSIUM JAN. 7–10, 2004 (Mogens Herman Hansen ed. 2004); *see also* Andrew Parslow, *Property Rights for Utopia?: Potential Conflicts Between Property Rights and Smart Cities* (unpublished 2020) (on file with the author).

[3] Shipley, *supra* note 2, at 335.

[4] Katharina Buchholz, *How Has the World's Urban Population Changed from 1950 to Today?*, WORLD ECON. F. (Nov. 4, 2020), https://www.weforum.org/agenda/2020/11/global-continent -urban-population-urbanisation-percent/ [https://perma.cc/2QET-62WW].

[5] *See* John Wagner Givens & Debra Lam, *Smarter Cities or Bigger Brother? How the Race for Smart Cities Could Determine the Future of China, Democracy, and Privacy*, 47 FORDHAM URB. L.J. 829, 831 (2020).

[6] *Id.* at 832 (citing Hannah Ritchie & Max Roser, *Urbanization*, OUR WORLD IN DATA (Sept. 2018), https://ourworldindata.org/urbanization [https://perma.cc/3SB4-QTAG]); *Cities and Pollution*, U.N., https://www.un.org/en/climatechange/climate-solutions/cities-pollution [https://perma.cc/9Z8K-PPUE] (last visited Mar. 26, 2021).

[7] ORG. FOR ECON. CO-OPERATION & DEV., RETHINKING URBAN SPRAWL: MOVING TOWARDS SUSTAINABLE CITIES 12 (2018).

[8] *See id.* at 12–13.

[9] *See* Edward Glaeser, *Reforming Land Use Regulations*, BROOKINGS INST. (Apr. 24, 2017), https://www.brookings.edu/research/reforming-land-use-regulations/ [https://perma.cc/4YN6-Y6L9].

[10] *See, e.g.*, U.N. ENV'T PROGRAM, *Solid Approach to Waste: How 5 Cities Are Beating Pollution*, https://www.unenvironment.org/news-and-stories/story/solid-approach-waste-how-5-cities-are-beating-pollution [https://perma.cc/CHT4-4Z3G] (last visited Mar. 26, 2021).

the challenge of improving urban areas for the benefit of their inhabitants while diminishing the environmental costs.[11] Though historically urbanization concerned only physical spaces, smart cities today combine physical with cyber infrastructure and resources. Smart cities come with bold and ambitious promises: to improve quality of life and the delivery of services, and to contribute to a cleaner and more sustainable environment.[12] Smart cities can do so through the analysis of real-time data collected by strategically positioned sensors. The data corralled are, in turn, transferred to servers (mostly on the cloud) where they are processed and analyzed, often by tools integrating artificial intelligence. Finally, the output of the analysis is used to guide the "smart city's" decision making.[13]

But as do all technological advancements, although smart cities offer solutions to complex problems, they come at a cost.[14] The question is whether these costs are understood by smart cities' citizens and visitors. An obvious cost is the loss of privacy, which is receiving much attention in academic as well as political circles.[15] Other costs include corporatization or privatization of public services,[16] privatization of citizens' data,[17] and datafication of citizens.[18] A further cost, less obvious but not less important,

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[11] *See generally* Kikki L. Ipsen et al., *Environmental Assessment of Smart City Solutions Using a Coupled Urban Metabolism—Life Cycle Impact Assessment Approach*, 24 INT. J. LIFE CYCLE ASSESS. 1239, 1240 (2019); ITRON, SMART CITIES WORLD TREND REPORT, WHERE'S THE ROI? (2019), https://www.smartcitiesworld.net/whitepapers/whitepapers/smart-cities-wheres-the-roi [https://perma.cc/VAL5-BLM6].

[12] MCKINSEY GLOB. INST., SMART CITIES: DIGITAL SOLUTIONS FOR A MORE LIVABLE FUTURE 4–8 (2018), https://www.mckinsey.com/business-functions/operations/our-insights/smart-cities-digital-solutions-for-a-more-livable-future [https://perma.cc/4WGT-V3ZR].

[13] Albert Meijer & Manuel Pedro Rodríguez Bolívar, *Governing the Smart City: A Review of the Literature on Smart Urban Governance*, 82 INT'L REV. ADMIN. SCI. 392–408, 400 (2016).

[14] *See, e.g.*, GERMAINE HALEGOUA, SMART CITIES 40–42 (2020) (demonstrating that from a theoretical perspective, framing smart cities in terms of solutions to urban problems is being challenged. Doing so limits the assessment of the impact of smart cities to a specific problem (e.g., pollution caused by traffic or waste management), while leaving unexplored other significant urban problems like poverty, lack of affordable housing and failing schools).

[15] Givens & Lam, *supra* note 5, at 838.

[16] HALEGOUA, *supra* note 14, at 18; ROB KITCHIN ET AL., CREATING SMART CITIES, CREATING SMART CITIES 5 (Rob Kitchin et al. eds., 2019).

[17] Sofia Ranchordás, *Law and Autonomous Systems Series: Cities as Corporations? The Privatization of Cities and the Automation of Local Law*, OXFORD BUS. L. BLOG (Apr. 18, 2018), https://www.law.ox.ac.uk/business-law-blog/blog/2018/04/law-and-autonomous-systems-series-cities-corporations-privatization [https://perma.cc/6KJV-JBYP].

[18] *See* VIKTOR MAYER-SCHÖNBERGER & KENNETH CUKIER, BIG DATA: A REVOLUTION THAT WILL TRANSFORM HOW WE LIVE, WORK, AND THINK 199 (2013); *see also* Alison Powell, *Datafication, Transparency, and Good Governance of the Data City*, *in* DIGITAL ENLIGHTENMENT YEARBOOK 215 (2014).

is advanced in this Article, namely the challenge in the governance of "smart cities" to establish clear lines of accountability for decisions based on smart city technologies.[19] Public mistrust in ubiquitous technology capable of surveillance is inextricably linked to the lack of transparency, critical in democratic systems. The question is whether these costs are necessary to achieve greater sustainability.

This Article is structured as follows: Part I offers a brief overview of how technology can foster sustainability, especially from an environmental perspective, by briefly charting two examples; Part II contains an analysis of what smart cities are by reference to the three core pillars that make a city "smart"; Part III reviews and integrates the growing literature probing the governance claims of smart cities, and explores some of the issues raised by the privatization of large data collection, the exposure of personal data, and the datafication of citizens; Part IV focuses on the perceived accountability gap in which smart cities risk running. Part IV also puts forward some suggestions on how to operationalize accountability in smart cities governance.

I. HOW CAN SMART CITY TECHNOLOGY FOSTER SUSTAINABILITY?

Cities around the world are in crisis as climate change, once a far-off warning voiced by scientists, has started to show its dramatic effects.[20] "Rising global temperatures cause sea levels to rise, increases [sic] the number of extreme weather events such as floods, droughts and storms, and increases [sic] the spread of tropical diseases."[21] These seemingly natural disasters are spurred by the pollution erupting from cities and have major impacts on cities' ability to provide their citizens with basic services and a healthy environment.[22] In order to wage battle against climate change, cities are forced to look within. "Estimates suggest that cities are responsible for seventy-five percent of global CO_2 emissions, with transport and buildings being among the largest contributors."[23] "Smart" technology, which will be discussed in more detail in Part III, has

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[19] *See, e.g.*, HALEGOUA, *supra* note 14, at 18 (demonstrating the growing body of literature exploring how governance needs to adapt in the context of Big Data); Karl Manheim & Lyric Kaplan, *Artificial Intelligence: Risks to Privacy and Democracy*, 21 YALE J.L. & TECH. 106, 169–70 (2019); Sofia Ranchordás & Abram Klop, *Data-Driven Regulation and Governance in Smart Cities*, RES. HANDBOOK ON DATA SCI. & L. (Vanessa Mak et al. eds., 2018) 264–65; Meijer & Bolívar, *supra* note 13, at 402.

[20] *See Cities and Pollution*, *supra* note 6.

[21] *Id.*

[22] *Id.*

[23] *Id.*

emerged as a valuable tool for cities to curb their emissions. What follows are two examples that give a glimpse of how technology can soften the environmental impact of human activities connected with urban spaces.

A. Transportation

Poor urban regulation has contributed to the creation of tragically inefficient cities that expand annually into suburbia.[24] Low motor fuel taxes and progress in car manufacturing have made it feasible for many city dwellers, particularly in the United States, to live outside the city while reaping the benefits of working or studying in the city center.[25] Urban sprawl has resulted in the loss of countryside,[26] increases in pavement laid, which boosts transportation pollution,[27] and increases in the per-user economic and environmental costs of public services.[28]

The average length of a city dweller's commute is correlated with the extent of urban sprawl within the city; however, a much stronger relationship exists between the length of a commute and congestion.[29] In 2018, transportation in the United States accounted for roughly twenty-eight percent of total greenhouse gas emissions.[30] Of that twenty-eight percent, light-duty vehicles accounted for fifty-nine percent of the pollution.[31] Especially in developing countries, urban pollution is a source of considerable financial loss as well as a considerable toll on health and human capital.[32] Accounting for sixteen percent of global fatalities, "[p]ollution is the largest environmental cause of disease and premature death."[33] Additionally, ambient air pollution is estimated to be a $5.7 trillion parasite on the global GDP.[34]

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[24] *See* ORG. FOR ECON. CO-OPERATION & DEV., *supra* note 7, at 12.
[25] *See id.* at 12–13.
[26] *See* EUR. COMM'N, URBAN SPRAWL IN EUROPE: THE IGNORED CHALLENGE 5 (2006).
[27] *See* ORG. FOR ECON. CO-OPERATION & DEV., *supra* note 7, at 12.
[28] *See id.*
[29] *See* Edmund J. Zolnik, *The Effects of Sprawl on Private-Vehicle Commuting Distances and Times*, 38 ENV'T & PLAN. B: PLAN. & DESIGN 1071, 1072, 1081 (2011).
[30] *Fast Facts on Transportation Greenhouse Gas Emissions*, EPA, https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions [https://perma.cc/2ZHE-24UZ] (last visited Mar. 26, 2021).
[31] *Id.*
[32] *Pollution*, WORLD BANK, https://www.worldbank.org/en/topic/pollution [https://perma.cc/5BEF-QSFF] (last visited Mar. 26, 2021).
[33] Phillip J. Landrigan et al., *The Lancet Commission on Pollution and Health*, 391 THE LANCET 462, 462 (2018).
[34] WORLD BANK, *supra* note 32.

Transportation accounts for over twenty-four percent of global CO_2 emissions.[35] Various cities around the world are addressing this stark statistic in different—"smart"—ways.[36] For example, Beijing set goals for replacing over 70,000 gasoline and diesel taxis with electric vehicles.[37] However, electric vehicles are only as clean as the plant that produces their electricity.[38] "Smart" technology offers ways to fight congestion, lessen commute times, and consequently lower emissions. Cities like Norwalk, Connecticut, are expanding their Close Loop Traffic Signal Systems into integrated Advanced Traffic Management Systems ("ATMS").[39] Norwalk's ATMS utilizes "video monitoring cameras, dynamic message signals, video detection systems and emergency preemption units" to "monitor and control traffic flows, detect incidents and inform drivers and the general public of roadway conditions."[40] By reducing the stop/start nature of urban traffic, cities are able to make the roads safer, reduce commute times, and curb emissions.[41] In Leeds, in the United Kingdom, the data collected by air sensors, which measure the density of pollutant air particles, are combined with geofencing so that the city's fleet of hybrid vehicles is automatically switched to electric-only mode in areas with poor air, thus allowing bad air patches to dissipate.[42] Other cities are tapping into existing or historic infrastructure to improve public transportation in an effort to combat congestion.[43]

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[35] Shiying Wang & Mengpin Ge, *Everything You Need to Know About the Fastest Growing Source of Global Emissions: Transport*, WORLD RES. INST. (Oct. 16, 2019), https://www.wri.org/blog/2019/10/everything-you-need-know-about-fastest-growing-source-global-emissions-transport [https://perma.cc/NK8X-826U].

[36] *See Four Things You Should Know About Climate-Smart Cities*, WORLD BANK (May 31, 2019), https://www.worldbank.org/en/news/feature/2019/05/31/four-things-you-should-know-about-climate-smart-cities [https://perma.cc/Q2J8-TZME].

[37] *Id.*

[38] *See* Mike Scott, *Yes, Electric Cars are Cleaner, Even When the Power Comes from Coal*, FORBES (Mar. 30, 2020), https://www.forbes.com/sites/mikescott/2020/03/30/yes-electric-cars-are-cleaner-even-when-the-power-comes-from-coal/?sh=52e8a90c2320 [https://perma.cc/J2NL-8DPF].

[39] *Advanced Traffic Management System*, NORWALK: THE SOUND OF CONN., https://www.norwalkct.org/1100/Advanced-Traffic-Management-System [https://perma.cc/P7QD-PA8L] (last visited Mar. 26, 2021).

[40] *Id.*

[41] *Id.*

[42] Grant Samms, *3 Ways Smart Cities Can Improve Air Quality*, SMART CITIES DIVE (June 25, 2020), https://www.smartcitiesdive.com/news/3-ways-smart-cities-can-improve-air-quality/580519/ [https://perma.cc/MFM5-JX4T].

[43] Los Angeles is resurrecting the street car and La Paz, Bolivia, has erected beautiful

B. Energy

Energy consumption is another increasingly difficult issue as cities continue to grow. Infrastructure that has been accumulating for decades is suddenly inefficient and impractical, but replacing it is equally challenging, if not impossible.[44] In Gretchen Bakke's book *The Grid*, Bakke shines a spotlight on the underwhelming American system of distributing electricity and the devastating amount of renewable energy that is wasted because the grid cannot store excess power.[45] Power is produced at great costs to the environment, but eight percent is wasted as power travels and is distributed from power plants to substations and, finally, to homes and businesses.[46]

Urban areas consume seventy-five percent of global primary energy.[47] It is imperative that energy distribution and consumption become "sustainable, more inclusive and fair" in order to "foster universal development" and combat climate change.[48] Hanoi, Vietnam, plans to reduce emissions and create electricity by building a facility that will "gather, process, and treat methane gas emitted from decomposing garbage to produce electricity, aiming to reduce methane emissions, environmental pollution and dependence on fossil fuels."[49] However, the heart behind such projects requires better, smarter infrastructure.

On a large scale, smarter infrastructure includes the implementation of "smart grids," which allow energy distribution to become decentralized and capable of utilizing small source, renewable energy.[50]

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cable-cars as its first mass transit system (Mi Teleferico). *See* Robert Kunzig, *These Five Cities Are Taking Bold Steps to Rein in Sprawl*, NAT'L GEO. (Mar. 14, 2019), https://www.nationalgeographic.com/environment/2019/03/five-cities-taking-bold-steps-future/#close [https://perma.cc/5PLT-RMP3].

[44] GRETCHEN BAKKE, THE GRID: THE FRAYING WIRES BETWEEN AMERICANS AND OUR ENERGY FUTURE 192–98 (2016).

[45] *Id.*

[46] *Electric Power Transmission and Distribution Losses (% of Output)*, WORLD BANK, https://data.worldbank.org/indicator/EG.ELC.LOSS.ZS [https://perma.cc/6YW9-T7AP] (last visited Mar. 26, 2021).

[47] *Energy*, U.N. HABITAT, https://unhabitat.org/topic/energy [https://perma.cc/HUX7-U54C] (last visited Mar. 26, 2021).

[48] *Id.*

[49] *Hanoi to Generate Electricity from the City's Biggest Landfill*, C40 CITIES, https://www.c40.org/case_studies/hanoi-to-generate-electricity-from-the-city-s-biggest-landfill [https://perma.cc/LZ6E-DPNQ] (last visited Mar. 26, 2021).

[50] Gerhard P. Hancke et al., *The Role of Advanced Sensing in Smart Cities*, 13 SENSORS 393, 405 (2013).

Traditional distribution of electricity provides a unidirectional flow from the generating station to the consumer.[51] New grid technology (called "smart") allows for two-way communication that improves the efficiency, reliability, and sustainability of power distribution in three main ways.[52] First, at the macro level, sensors measure fluctuating load flows and provide warnings when lines become overloaded.[53] Since overuse is detected *before* lines become hazardous, transmission lines are more reliable.[54] Non-functioning lines are immediately detected, and automated feeder-switches reroute electricity to greater reduce the frequency and duration of blackouts.[55] Second, at the meso level, in order to assist in the redistribution and conservation of electricity, strategically placed batteries build charge by using excess energy returned from consumers.[56] This energy reserve is then available for redistribution during peak usage, or in the event of environmental disasters or technical failures.[57] The added benefit of this kind of technology is that it also generally reduces waste during unnecessarily long-distance transfers of power.[58] Lastly, at the micro level, smart metering within homes and businesses gives consumers accurate and real-time information as to their usage, which aids in conservation and means financial savings.[59] Smart grids also have the added benefit of allowing consumers who produce their own energy (for instance, through solar panels) to sell their excess amounts back to the grid.[60]

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[51] *Id.*
[52] In the EU, the TEN-E Regulation defines a smart grid as "an electricity network that can integrate in a cost efficient manner the behaviour and actions of all users connected to it, including generators, consumers and those that both generate and consume, in order to ensure an economically efficient and sustainable power system with low losses and high levels of quality, security of supply and safety." Regulation 347/2013, of the European Parliament and of the Council of 17 April 2013 on guidelines for trans-European energy infrastructure and repealing Decision No 1364/2006/EC and amending Regulations (EC) No 713/2009, (EC) No 714/2009, (EC) No 715/2009, art. 2(7), 2013 O.J. (L 115) 39, 45.
[53] *See* Hancke et al., *supra* note 50; *see also Grid Modernization and the Smart Grid*, OFFICE OF ELEC., https://www.energy.gov/oe/activities/technology-development/grid-modernization-and-smart-grid [https://perma.cc/ATB9-DQLK] (last visited Mar. 26, 2021).
[54] Hancke et al., *supra* note 50; *see also* OFFICE OF ELEC., *supra* note 53.
[55] Hancke et al., *supra* note 50.
[56] OFFICE OF ELEC., *supra* note 53.
[57] Hancke et al., *supra* note 50; *see also* OFFICE OF ELEC., *supra* note 53.
[58] Hancke et al., *supra* note 50.
[59] *Id.*; *see also* OFFICE OF ELEC., *supra* note 53.
[60] *See, e.g.*, Jillian Ambrose, *New Rules Give Households Right to Sell Solar Power Back to Energy Firms*, GUARDIAN (June 9, 2019), https://www.theguardian.com/environment

More could be written about the ways in which technology can produce a lesser impact on the environment, but this Article intends to focus on the governance challenges posed by smart cities, especially from the perspective of accountability. Before focusing on the governance theme, Part II contains an analysis of what smart cities are.

II. THE THREE PILLARS OF THE CITIES THAT ARE "SMART"

There are numerous definitions of what qualifies as a "smart" city.[61] Some definitions are aspirational and focus on the ideal, perhaps utopic, modern city (a bit like the Greek *polis*), while others concentrate on the technology used—whether it is retrofitted to existing cities or it grows alongside them. Some focus on the level of technological intelligence deployed through the cities' infrastructure. Still others focus on the level of inclusion that the smart city is capable of achieving.[62] However, what unites cities under the label of "smart" is the objective "of improving 'urban problems' through digital technology 'solutions.'"[63]

Instead of focusing on a definition, this Article wants to highlight the three core pillars that make cities "smart."[64] They are infrastructure, digital management of public issues, and humans (people, government, and the private sector). Each will be considered in turn.

A. *Pillar I—Physical and Cyber Infrastructure: The Internet of Things*

The Internet of Things, or IoT, is a collective term used to describe the billions of devices and machines that are linked to the internet,

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/2019/jun/09/energy-firms-buy-electricity-from-household-rooftop-solar-panels [https://perma.cc/LQF8-BSEM].

[61] Meijer & Bolívar, *supra* note 13, at 396; Vito Albino et al., *Smart Cities: Definitions, Dimensions, Performance, and Initiatives*, 22 J. URB. TECH. 3, 6–8 (2015).

[62] Albino et al., *supra* note 61, at 8–9.

[63] HALEGOUA, *supra* note 14, at ix.

[64] As with the definition, there is no agreed view in the literature on how many "pillars" buttress the concept of smart cities. Those proposed in this Article represent the author's own view. However, in the discourse on smart cities, commentators identify from four to fourteen pillars *See* Jo Imeson, *Lisbon's 4 Pillars of Smart City Development*, INFORM (Dec. 2015), https://inform.tmforum.org/features-and-analysis/2015/12/lisbons-4-pillars-of-smart-city-development/ [https://perma.cc/Q66T-NQF6]; Clint Vince, *The 14 Pillars of a Smart City*, SMART CITIES WORLD (Mar. 26, 2020), https://www.smartcitiesworld.net/opinions/opinions/the-14-pillars-of-a-smart-city [https://perma.cc/8CK6-HPHJ].

through wired or, more commonly, wireless connections.[65] These devices do not simply include those that traditionally have had internet connectivity, like personal computers and laptops, but also others whose functionality is augmented by the internet. In this latter category fall smart phones and wearable technology like activity trackers and smart watches, as well as domestic electronics (televisions, refrigerators and washing machines), vehicles (self-driving cars and drones), and even implanted medical devices, such as insulin pumps and pacemakers. All of these "things," spanning from ephemeral to life-saving, act as "sensors/actuators which are able to operate and transmit data to other systems without or with minimal human intervention."[66]

There are two main features that make the IoT so critical to smart cities. The first is that, as Samuel Greengard put it, "[t]he IoT involves the movement of data to enable processes from across the room or somewhere on the other side of the world."[67] Otherwise-inert devices are now enabled to collect data about the environment around them and send those data "home" to the cyber space. "Home" is often the cloud-based servers where the data collected by sibling devices are mingled and processed, and the output of the analysis is then pushed back to the physical world. Take an activity tracker, like Fitbit, which is comprised of hardware, including sensors, and proprietary software that captures structured data generated by the movement, from steps to heartbeats, of the person wearing it.[68] These data points are recorded on the device and sent to the

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[65] It is difficult to provide an accurate estimate of the number of IoT devices currently circulating in the world. Several sources suggest that there are tens of billions of them. *See Number of Internet of Things (IoT) Connected Devices Worldwide in 2018, 2025 and 2030*, STATISTA (Jan. 22, 2021), https://www.statista.com/statistics/802690/worldwide-connected-devices-by-access-technology/ [https://perma.cc/Y7G6-7NEQ]; LEADING THE IOT, GARTNER INSIGHTS ON HOW TO LEAD IN A CONNECTED WORLD 13 (2017).

[66] Nguyen Cong Luong et al., *Data Collection and Wireless Communication in Internet of Things (IoT) Using Economic Analysis and Pricing Models: A Survey*, 18 no. 4 IEEE COMMUNICATIONS SURVEYS & TUTORIALS, Fourth Quarter 2016, at 1.

[67] SAMUEL GREENGARD, THE INTERNET OF THINGS 15 (MIT Press 2015).

[68] Fitbit's Privacy Policy states as follows:

> INFORMATION WE RECEIVE FROM YOUR USE OF OUR SERVICES
>
> DEVICE INFORMATION
>
> Your device collects data to estimate a variety of metrics like the number of steps you take, your distance traveled, calories burned, weight, heart rate, sleep stages, active minutes, and location. The data collected varies depending on which device you use. . . . When your

manufacturer's server where they are analyzed by algorithmic tools (many of which rely on machine learning techniques).[69] The output of that analysis is pushed to the app or dashboard where the user can interrogate the data to glean an insight on, for instance, the number of steps made or calories burned over the course of the day.[70]

In a smart city, the IoT creates something like a connective tissue across the layers of the city (air, street level, and underground), and real-time data are collected from each layer. IoT devices are continuously recording and sharing data—they never sleep. For a smart city, this translates into the potential of accessing real-time and unprecedentedly granular data about the city. The physical, "offline" world that was difficult and time-consuming to investigate is now, potentially, just a click away. Massive amounts of information providing all sorts of insight into the city, its dwellers, resources, and environment are now available: Big Data has arrived.

> device syncs with our applications or software, data recorded on your device is transferred from your device to our servers.
>
> GEOLOCATION INFORMATION
>
> The Services include features that use precise geolocation data, including GPS signals, device sensors, Wi-Fi access points, and cell tower IDs. We collect this type of data if you grant us access to your location. You can always remove our access using your Fitbit device or mobile device settings. We may also derive your approximate location from your IP address.
>
> USAGE INFORMATION
>
> When you access or use our Services, we receive certain usage or network activity information. This includes information about your interaction with the Services, for example, when you view or search content, install applications or software, create or log into your account, pair your device to your account, or open or interact with an application on your Fitbit device.
>
> We also collect data about the devices and computers you use to access the Services, including IP addresses, browser type, language, operating system, Fitbit or mobile device information (including device and application identifiers), the referring web page, pages visited, location (depending on the permissions you have granted us), and cookie information.

Fitbit Privacy Policy, FITBIT, https://www.fitbit.com/global/us/legal/privacy-policy [https://perma.cc/6SQH-YX58] (last visited Mar. 26, 2021).

[69] *Id.*

[70] *Id.*

Being able to tap into this wealth of data requires, however, strong physical and cyber infrastructure. The physical infrastructure includes fixed and movable IoT devices dotted across the physical space—be it air-quality sensors on busy roads,[71] geo trackers on public transport,[72] sensors in trash bins,[73] close circuit television ("CCTV") at every corner,[74] and even Wi-Fi connectors in citizens' smart phones.[75] However, there must be another layer of physical infrastructure that allows these devices to connect to the internet (which, itself, has a very physical "backbone").[76] This layer comprises fiber optic cables, cell towers, digital and electrical networks, and so on. On the other hand, "[c]yberinfrastructure consists of computing systems, data storage systems, advanced instruments and data repositories, visualization environments, and people, all linked together by software and high performance networks to improve research productivity and enable breakthroughs not otherwise possible."[77] Neither is cheap, as will be discussed below.

B. *Pillar II—Information and Communication Technologies ("ICTs") to Optimize the City*

The second feature that makes the IoT so critical to smart cities is also its second pillar, namely the fact that "what makes a city a Smart City is the use of ICTs . . . to optimise the efficiency and effectiveness of useful and necessary city processes, activities and services."[78] With the

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[71] *See* Christian Toma et al., *IoT Solution for Smart Cities' Pollution Monitoring and the Security Challenge*, 19 SENSORS 2 (2019).
[72] *See* Wenwen Li et al., *Real-Time GIS for Smart Cities*, 34 INT'L J. GEOGRAPHICAL INFO. SCI. 311, 311–14 (2019).
[73] *See* Patience Haggin, *How a 'Smart' Trash Bin Can Transform City Garbage Collection*, WALL ST. J. (May 21, 2019), https://www.wsj.com/articles/how-a-smart-trash-bin-can-transform-city-garbage-collection-11558452400 [https://perma.cc/2HE3-YW2Y].
[74] *See* Erik Vesneski, *11 Smart City Use Cases*, WORLD WIDE TECH. (Mar. 4, 2020), https://www.wwt.com/article/11-smart-city-use-cases [https://perma.cc/9KY9-B498].
[75] MCKINSEY GLOB. INST., *supra* note 12, at 21 ("Smartphones are the new keys to the city. They are an interface anyone can use to tap into a wealth of instant information about transit, vital services, alerts, and community news, and they generate a stream of data themselves").
[76] *See* Tim Greene, *What Is the Internet Backbone and How It Works*, NETWORLD (Mar. 12, 2020), https://www.networkworld.com/article/3532318/what-is-the-internet-backbone -and-how-it-works.html [https://perma.cc/5SEE-YYU4].
[77] Craig Stewart et al., *What is Cyberinfrastructure?*, PROC. ACM SIGUCCS USER SERV. CONF. 1, 2 (2010).
[78] Eur. Parl., Directorate General for Internal Policies, MAPPING SMART CITIES IN THE EU, IP/A/ITRE/ST/2013-02, 23 (Jan. 2014).

right ICTs, the vast amount of data collected through the IoT can be used—or such is the promise—to drive more efficient, sustainable, and optimal solutions to urban problems.[79] ICTs are responsible for the wave of automation of infrastructure systems. Automation of infrastructure is presented as having a number of benefits, including a significant lowering of carbon emissions.[80]

This narrative is not dissimilar from the account of the successful deployment of the IoT in industrial applications such as manufacturing, mining, logistics and supply-chain, often referred to as Industrial Internet of Things or IIoT.[81] For instance, after one of its factories was IoT enabled, Harley-Davidson Motor Company is said to have achieved a ten- to twenty-five-fold improvement in build-to-order cycle times, cutting the wait time for custom-made motorcycles from eighteen months down to two weeks.[82] "The company converged its multiple networks into a single network and began consolidating data islands. . . . That alone led to increased productivity, efficiency, flexibility, and agility."[83] Rio Tinto has been using the IoT to achieve greater predictive preventative maintenance of its autonomous trucks that haul millions of tons of material in its open-pit mines.[84] Being able to anticipate accurately when vehicles will fail saves millions of dollars in out-of-pocket costs and preventable delays in lost production time.[85] Amazon is one of the best examples of how logistical challenges and costs have been greatly reduced by relying on the IoT in its warehouses.[86]

The success of the IIoT is linked not only to smart devices and data, but also—and critically so—to how those data are processed, analyzed, and interrogated, mostly with the assistance of artificial intelligence ("AI"). This is not the place to delve into the complexities of AI systems, but suffice it to say that they can—and do—contribute to smart cities in four main ways.[87] They can be *descriptive* and tell city officials

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[79] HALEGOUA, *supra* note 14, at 5.
[80] MCKINSEY GLOB. INST., *supra* note 12, at 55–56.
[81] MACIEJ KRANZ, BUILDING THE INTERNET OF THINGS: IMPLEMENT NEW BUSINESS MODELS, DISRUPT COMPETITORS, TRANSFORM YOUR INDUSTRY ix–x (2017).
[82] *Id.* at 6–7.
[83] *Id.* at 6.
[84] *Id.* at 47–49.
[85] *Id.* at 49.
[86] Kim Bhasin & Patrick Clark, *How Amazon Triggered a Robot Arms Race*, BLOOMBERG (June 29, 2016), https://www.bloomberg.com/news/articles/2016-06-29/how-amazon-triggered-a-robot-arms-race [https://perma.cc/3ABC-4XSB].
[87] Iria Giuffrida, *Liability for AI Decision-Making: Some Legal and Ethical Considerations*, 88 FORDHAM L. REV. 439, 440 (2019).

what happened—such as facial recognition embedded in CCTV cameras capable of identifying a criminal suspect.[88] They can be *diagnostic* as they explain why something happened—such as a smart water grid determining the source of a water leakage.[89] They can be *predictive* as they can forecast what will (statistically) happen—this would be the case for predictive maintenance assisting public transport agencies in maintaining their fleet of vehicles.[90] Lastly, they can be *prescriptive* in that they are capable of performing actual decision making and implementation—such as smart traffic lights autonomously directing vehicle and pedestrian traffic to more efficient routes.[91]

The ability to automate functions previously conducted by human beings, coupled with the power to see previously unseen patterns and make predictions based on the data collected, are enormously attractive tools to help public officials build and maintain cities, hence the rise in popularity of "data-driven regulation."[92] However, to maximize the benefits that can be achieved through the data, it is necessary to integrate and standardize physical, digital, and social systems, which is a significant challenge.[93] This is the crux of the AI Ecosystem, hypothesized as a combination of "AI systems interacting in a data-rich environment, fueled by the 'internet of things,' enabled by sensors, blockchain, and other technologies. Data

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[88] *Live Facial Recognition*, METRO. POLICE, https://www.met.police.uk/advice/advice-and-information/facial-recognition/live-facial-recognition/ [https://perma.cc/FL9W-SRXZ] (last visited Mar. 26, 2021). Live Facial Recognition has raised a number of concerns and is currently under legal review. *See* Damien Gayle, *Met Police Deploy Live Facial Recognition Technology*, GUARDIAN (Feb. 11, 2020), https://www.theguardian.com/uk-news/2020/feb/11/met-police-deploy-live-facial-recognition-technology [https://perma.cc/U8XE-EKF4].

[89] *See* S. V. Mohanasundaram et al., *Smart Water Distribution Network Solution for Smart Cities: Indian Scenario*, GLOBAL INTERNET OF THINGS SUMMIT (GIoTS), 2018 at 1–6.

[90] *See* Patrick Killeen et al., *IoT-Based Predictive Maintenance for Fleet Management*, 151 PROCEDIA COMPUT. SCI. 607, 607–08 (2019).

[91] *See* Paul Stenquist, *Smarter Traffic Lights, Calmer Commuters*, N.Y. TIMES (Dec. 10, 2020), https://www.nytimes.com/2020/12/10/business/smart-traffic-lights.html [https://perma.cc/U7ZH-WNSX].

[92] The term "data-driven regulation" "refers to the broad use of predictive analytics, including different types of artificial intelligence (AI), algorithms, [and] cloud computing, to collect and process data that is used directly or indirectly to issue administrative decisions (e.g., granting a building permit or an allowance)." Ranchordás & Klop, *supra* note 19, at 248. For a more positive assessment of the virtues of data-driven regulation, *see* Simon E. Bibri, *The Anatomy of the Data-Driven Smart Sustainable City: Instrumentation, Datafication, Computerization and Related Applications*, 6 J. BIG DATA 59 (2019).

[93] Teena Maddox, *New Forum Seeks to Unite 100 Cities in Standards to Drive Smart City Innovation*, TECHREPUBLIC (Mar. 9, 2016), https://www.techrepublic.com/article/new-forum-seeks-to-unite-100-cities-in-standards-to-drive-smart-city-innovation/ [https://perma.cc/S49Q-BBJH] ("Standardization is key to smart city success.").

is constantly created, exchanged, analyzed, pooled, and reassessed."[94] Smart cities are the most obvious manifestation of the potentials of the AI Ecosystem and, as will be discussed below, of its perils.

C. *Pillar III—The Humans: People, Government, and Industry*

We, the humans, form the third pillar of any smart city. Humans matter (1) as dwellers and users of the smart city's services—the people; (2) as public decision-makers—the government; and (3) as the source of inventions, resources, and knowhow—the industry.

1. People

People are a vital component of smart cities in different ways. They live in the city: they are the commuters relying on real-time traffic data, the consumers that dispose of waste, and the residents in high-density housing. But they are, critically, also the source of data: they drive the cars that congest cities and pollute the air, they produce waste that they do not recycle, and they organize large indoor gatherings in defiance of public-health lockdown rules.[95]

People are also the addressees of decisions driven by the data collected by the smart city. Sometimes openly so, such as when cities implement smart street lighting to decrease the energy and cost wastage by digitalizing the management of lights.[96] Lights come on when "needed" through a combination of motion sensors and IoT transmitters; and energy-efficient lights (e.g., LEDs) save energy and reduce the emission of heat.[97] Other times, citizens are recipients of smart city decisions more obliquely,

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[94] Giuffrida, *supra* note 87, at 442.

[95] *See, e.g.*, Jennifer Hermes, *How Traffic Jams Affect Air Quality*, ENV'T LEADER (Jan. 5, 2012), https://www.environmentalleader.com/2012/01/how-traffic-jams-affect-air-quality/ [https://perma.cc/3Q8H-Y37V]; Tracy Fernandez Rysavy, *Americans Are Really Bad at Recycling. But Only Because We're Not Trying Very Hard.*, GREEN AMERICA, https://www.greenamerica.org/rethinking-recycling/americans-are-really-bad-recycling-only-because-were-not-trying-very-hard [https://perma.cc/2V76-CTK2]; Jasmine Aguilera, *'Your Actions Are Jeopardizing Public Health.' Despite Dire COVID-19 Warnings, Many Americans Continue to Party*, TIME (Mar. 16, 2020), https://time.com/5804089/us-coronavirus-social-distancing-party/ [https://perma.cc/9HAL-H8NP].

[96] Doug Cooley, *Battling Traffic Jams with Smarter Traffic Signals*, SMART CITIES COUNCIL (Feb. 25, 2015), https://smartcitiescouncil.com/article/battling-traffic-jams-smarter-traffic-signals [https://perma.cc/38E8-6268].

[97] *See* Simon E. Bibri & John Krogstie, *The Emerging Data-Driven Smart City and Its Innovative Applied Solutions for Sustainability: The Cases of London and Barcelona*, 3 ENERGY INFORMATICS 1, 17 (2020).

which is the case when their electricity meters are replaced by "smart meters."[98] In other occasions, people are just "nudged" to behave a certain way[99] by, for instance, personalized emails suggesting public-transport routes to discourage the use of private vehicles.[100]

Although smart cities appear to have the potential to cure a number of environmental ailments caused by urban spaces, there are growing concerns that some communities within smart cities are at risk of being overlooked, as may be the case if they lack the necessary access to, or familiarity with, the technology that is so essential to smart cities.[101] As powerfully put by Glasmeier and Christopherson, "[p]overty is not on the agenda of smart city planners. They may solve traffic problems, but it is not clear how they will regenerate failing schools or find ways to include neighbourhoods facing disinvestment."[102] This is one of the many challenges to the idea that smart cities are going to set off "a virtuous circle of benefits."[103]

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[98] The author's own was replaced, rather unceremoniously and with little notice, at the time of drafting this Article. *Smart Metering: The Role, Context and Market of Smart Meters*, I-SCOOP, https://www.i-scoop.eu/internet-of-things-guide/smart-metering-smart-meters/ [https://perma.cc/4EPJ-TASG] (last visited Mar. 26, 2021).

[99] Nudging theory rests on the idea that the architecture of choices should be shaped by how *people* think and decide—instinctively and irrationally—rather than how decision-makers *believe* people would think and decide—logically and rationally. This choice architecture freely allows people to make presumably smarter and better choices, without imposition. Cass R. Sunstein, *The Rise of Behavioral Economics: Richard Thaler's Misbehaving*, 2 J. BEHAV. ECON. POL'Y 53, 55 (2018). This theory was first proposed in the seminal book by Richard Thaler & Cass R. Sunstein, NUDGE: IMPROVING DECISIONS ABOUT HEALTH, WEALTH, AND HAPPINESS (2009).

[100] Laura Bliss, *Durham's Plan to 'Nudge' Drivers Out of Cars*, BLOOMBERG CITYLAB (Oct. 30, 2018), https://www.bloomberg.com/news/articles/2018-10-30/durham-s-1-million-plan-to-nudge-drivers-out-of-cars [https://perma.cc/599X-RGCH].

[101] Ranchordás & Klop, *supra* note 19, at 266; Exhibit AI, *Exhibit 10: Smart Cities & Civil Rights, Part II*, CTR. FOR LEGAL & CT. TECH. (May 16, 2020), https://www.legaltechcenter.net/a-i/exhibit-ai/ [https://perma.cc/6VH5-WKUV] (arguing that smart cities have the unique opportunity to integrate in their design the needs of diverse populations, such as the Intellectual and Developmental Disabilities (I/DDs) community. The commentators note that the designers of the technologies embedded in smart cities and smart city officials have to think about designing for everyone—or designing explicitly for those in the I/DD community, as well as everyone else. They argue in favor of creating a new "default" user that, from the outset, takes into account of diverse populations, and not as an afterthought or an added benefit to the traditional user. The traditional default user of an able-bodied, Western white male does not just limit users; it also closes off possible avenues of technological development.).

[102] Amy Glasmeier & Susan Christopherson, *Thinking About Smart Cities*, 8 CAMBRIDGE J. OF REGIONS, ECON. & SOC'Y 3, 6 (2015).

[103] MCKINSEY GLOB. INST., *supra* note 12, at 11.

2. Government

People, as the ultimate beneficiaries of smart cities, are also participants in local governance. This is an important aspect of accountability that will be addressed further below.[104] A large portion of smart city projects begins with governments, both local and national, in both developed and developing nations.[105] As noted above,[106] cities are faced with novel issues from migration to urban spaces, to growing environmental and global health concerns to name a few. Local and national governments are turning to novel technologies to combat pollution, traffic congestion, and urban sprawl, and generally to increase the quality of living.[107] From the governmental perspective, smart city technology is a solution to the seemingly unanswerable issues that plague modern cities.

Smart city initiatives are flashy. For local governments, to oversee a city labeled as technologically advanced, and to be capable of addressing complex socio-environmental issues, is a source of pride and support during the election season.[108] For instance, in cities like Los

[104] *See infra* Part IV.
[105] *See, e.g.*, India's smart city mission led by Modi (thought to be somewhat successful), *Smart Cities Mission*, MINISTRY OF HOUS. & URBAN AFF., GOV'T OF INDIA, smart cities.gov.in/content/ [https://perma.cc/TA5G-A6GX]; Nidhi Sharma, *In 4th year, mission Smart Cities sees big gains*, ECON. TIMES (June 25, 2019), https://economictimes.india times.com/news/politics-and-nation/in-4th-year-mission-smart-cities-sees-big-gains /articleshow/69935983.cms?from=mdr [https://perma.cc/8NGZ-C67M]; *see also* Toronto's smart city fiasco with Sidewalk Labs, *Toronto Tomorrow*, SIDEWALK TORONTO, https:// www.sidewalktoronto.ca [https://perma.cc/J85F-Y2SM]; Blayne Haggart & Natasha Tusikov, *Sidewalk Labs' smart-city plans for Toronto are dead. What's next?*, THE CONVERSATION (May 8, 2020), https://theconversation.com/sidewalk-labs-smart-city -plans-for-toronto-are-dead-whats-next-138175 [https://perma.cc/9R2C-Y8AT].
[106] *See supra* Part I.
[107] *See, e.g.*, MINISTRY OF HOUS. & URBAN AFF., GOV'T OF INDIA, *supra* note 105; SIDEWALK TORONTO, *supra* note 105.
[108] Smart city initiatives are sweeping the nation from Houston, Los Angeles, New York City, to Buffalo and St. Louis. *Houston: Smart City of the Future*, CITY OF HOUS., https:// houstontx.gov/smartcity/ [https://perma.cc/T5C4-3T5G] (last visited Mar. 26, 2021); *Projects*, INFORM. TECH. AGENCY, CITY OF L.A., https://ita.lacity.org/news/projects [https://perma .cc/4J8V-9DBS] (last visited Mar. 26, 2021); *Smart Cities*, N.Y.C. ECON. DEV. CORP., https://edc.nyc/industry/smart-cities [https://perma.cc/2WU2-78QN] (last visited Mar. 26, 2021); Diedre Williams, *Buffalo, N.Y., Mayor Outlines Extensive Smart City Plans*, GOV'T TECH. (Feb. 21, 2020), https://www.govtech.com/computing/Buffalo-NY-Mayor-Outlines -Extensive-Smart-City-Plans.html [https://perma.cc/V3N8-ARFV]; *City of St. Louis Launches New, Interactive Smart City Digital Kiosks*, CITY OF ST. LOUIS (Jan. 22, 2020), https://www.stlouis-mo.gov/government/departments/mayor/news/interactive-smart-city

Angeles[109] and New York,[110] smart city technology promises to reduce traffic congestion and reduce air pollution created by mass and private transportation. Local governments are key in these changes. In Los Angeles, former Mayor Rahm Emanuel asked Elon Musk for a driverless car program and was met with several proposals from Tesla's CEO.[111] The result of the discussions was the creation of the Boring Company and their Loop and Hyperloop public transportation systems.[112]

In New York City, Mayor De Blasio plans to use smart city technology to bridge the digital and wealth divide in New York City's neighborhoods.[113] Brownsville will be home to the City's first Innovation Lab, a space bringing together "community members, government, educators, and tech companies to help address neighborhood concerns with cutting-edge smart city technologies."[114] Among chief concerns for the technological equity unitive are improved safety and cleanliness of public spaces, and increased access to healthy foods.[115]

State, federal, and international organizations like the U.N. have also enacted smart city initiatives or funded smart city projects to fulfill promises made through legislation and treaties.[116] In July 2020, Empire State Development announced $1 million in funding for New York State's Smart Cities Innovation Partnership, a collaboration between New York

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-digital-kiosks-launch.cfm [https://perma.cc/E55Z-SCGC]. Whether these initiatives will ever come to full fruition is another question. *See also* Glasmeier & Christopherson, *supra* note 102, at 4.

[109] Cooley, *supra* note 96.

[110] HELLMANN ELEC., BIG APPLE, SMART CITY: HOW NEW YORK IS FAST BECOMING THE GREATEST SMART CITY IN THE WORLD 8 (2019).

[111] Sarah Emerson, *Emails Show Los Angeles Mayor's Office Asked Elon Musk for a Driverless Car Program*, VICE (Aug. 8, 2017), https://www.vice.com/en/article/7xxzwq/emails-show-los-angeles-mayors-office-asked-elon-musk-for-a-driverless-car-program-tesla [https://perma.cc/V7AJ-F2SK].

[112] *Id.*; *see also Projects*, THE BORING CO., https://www.boringcompany.com/projects [https://perma.cc/6Q97-GBPH] (last visited Mar. 26, 2021).

[113] *De Blasio Administration Announces Launch of New Smart City Technologies and Young Innovators Program in Brownsville*, OFF. OF THE MAYOR. N.Y.C. (July 7, 2017), https://www1.nyc.gov/office-of-the-mayor/news/463-17/de-blasio-administration-launch-new-smart-city-technologies-young-innovators [https://perma.cc/8TF4-TWFC].

[114] *Id.*

[115] *Id.*

[116] *See* KIRSTIN ANDERSON-HALL ET AL., RACE TO THE FUTURE OF AMERICAN CITIES: THE STATUS & DEMAND FOR FEDERAL SMART CITY LEGISLATION (2021); *United Smart Cities (USC)*, U.N. SUSTAINABLE DEV., https://sustainabledevelopment.un.org/partnership/?p=10009 [https://perma.cc/VB89-RFVU] (last visited Mar. 26, 2021).

State and the Israel Innovation Authority ("IIA").[117] Coming in the wake of COVID-19's devastating effects on the state of New York, the money will be used to disperse emerging technologies through the city to improve government services and general quality of life.[118] The exact projects to be undertaken will be determined by academic experts and technology companies at a later date.[119] However, the timing of the money would suggest that New York feels pressure to restructure city services in the wake of one of New York City's toughest years.[120]

The fear of falling technologically behind other cities extends all the way to the highest office of the nation in the United States. In 2016, President Obama doubled down on his Smart City Initiative by allocating an additional $80 million in federal money.[121] With the additional funding, Obama declared that:

> If we can reconceive of our government so that the interactions and the interplay between private sector, non-profits, and government are opened up, and we use technology, data, social media in order to join forces around problems, then there's no problem that we face in this country that is not soluble.[122]

While Obama spoke of solving the biggest issues in the United States with collective action and novel uses of technology,[123] there may be another

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[117] *Empire State Development Announces $1 Million Awarded to Seven Smart Cities to Develop Innovative Technological Solutions to Municipal Challenges*, EMPIRE STATE DEV., N.Y. STATE (July 10, 2020), https://esd.ny.gov/esd-media-center/press-releases/esd-announces-one-million-awarded-seven-smart-cities [https://perma.cc/C5H5-Q5KK].
[118] *Id.*
[119] *Id.*
[120] J. David Goodman, *'I Don't Think the New York That We Left Will Be Back for Some Years,'* N.Y. TIMES (May 6, 2020), https://www.nytimes.com/2020/04/20/nyregion/new-york-economy-coronavirus.html [https://perma.cc/9LWW-WLK3].
[121] Press Release, The White House, Office of the Press Secretary, FACT SHEET: Announcing Over $80 million in New Federal Investment and a Doubling of Participating Communities in the White House Smart Cities Initiative (Sept. 26, 2016), https://obamawhitehouse.archives.gov/the-press-office/2016/09/26/fact-sheet-announcing-over-80-million-new-federal-investment-and [https://perma.cc/TY2M-RBPF].
[122] *Id.*
[123] Press Release, The White House, Office of the Press Secretary, *Remarks by the President at South By Southwest Interactive* (Mar. 11, 2016), https://obamawhitehouse.archives.gov/the-press-office/2016/03/14/remarks-president-south-southwest-interactive [https://perma.cc/5DP9-F4WX].

explanation for his Smart City Initiative. In 2015, when his administration first set out the smart city initiative, China had already elevated to be the world's smart city technology powerhouse with "over 296 localities including cities, districts, counties and townships having their own smart city initiatives."[124] That same year, India's Prime Minister Modi had launched the Smart City Mission,[125] while already in 2012 the EU had established the European Innovation Partnership on Smart Cities and Communities ("EIP-SCC") bringing together public and private actors to, *inter alia*, improve the quality of citizens' lives while also increasing the competitiveness of Europe's industry and innovative small and medium enterprises.[126] This was inevitably exerting pressure on the United States to ante up or fall behind.

India's smart city mission looks different from its United States counterpart. While, as noted above,[127] smart city technology in the United States is being tested predominantly in large metropolitan areas to solve the issues of modern cities, India is using smart city technology to create modern cities from the ground up.[128] Historically, India's residents lived in village settings, however, urbanization has been moving large swathes of the population towards cities.[129] Prime Minister Modi's Smart City Mission seeks to create 100 smart cities out of Indian villages.[130] One of

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[124] Wenzuan Yu & Chengwei Xu, *Developing Smart Cities in China: An Empirical Analysis*, 5 INT'L J. PUB. ADMIN. DIGIT. AGE 76, 77 (2018).

[125] *About Smart Cities Mission*, MINISTRY OF HOUS. & URBAN AFF., GOV'T OF INDIA, http://smartcities.gov.in/about-scm [https://perma.cc/FN2J-6AM9] (last visited Mar. 26, 2021).

[126] *Communication from the Commission: Smart Cities and Communities—European Innovation and Partnership*, at 2–3, COM (2012) 4701 final (Oct. 7, 2012). *See* Isabella Maschio, *European Innovation Partnership on Smart Cities and Communities*, EUR. COMM'N (Dec. 10, 2020), https://ec.europa.eu/info/eu-regional-and-urban-development/topics/cities-and-urban-development/city-initiatives/smart-cities_en [https://perma.cc/W5XZ-WXJC]. *See generally Smart Cities Marketplace*, EUR. COMM'N, https://smart-cities-marketplace.ec.europa.eu [https://perma.cc/AJ84-ECPQ] (last visited Mar. 26, 2021). On October 1, 2020, the Marketplace of the EIP-SCC became the Smart Cities Marketplace, a step closer to its merger with the Smart Cities Information System ("SCIS"). *The Smart Cities Marketplace gathers European Smart City actors*, EUR. COMM'N (Sept. 30, 2020), https://cordis.europa.eu/article/id/422330-the-smart-cities-marketplace-gathers-european-smart-city-actors [https://perma.cc/88RN-RK6F].

[127] *See, e.g.*, *supra* notes 24–43 and accompanying text.

[128] *See* Rama Lakshmi, *Indian officials want 100 'smart cities.' Residents just want water and power*, WASH. POST (June 26, 2015), https://www.washingtonpost.com/world/asia_pacific/india-wants-to-build-100-smart-cities-residents-just-want-water-and-power/2015/06/25/9951df1a-0ec6-11e5-a0fe-dccfea4653ee_story.html [https://perma.cc/ZSF4-4NTT].

[129] *Id.*

[130] *Id.*

the cities earmarked for funding is Ajmer, home of the famous thirteenth century Sufi shrine.[131] In 2015, the citizens of Ajmer had access to running water for just two hours every two days, only 130 of 125,000 homes were connected to the sewage system, trash was piled in the streets, and only two traffic lights were functioning.[132] Modi's fascination with smart cities in South Korea, China, and Abu Dhabi inspired the scheme to solve these issues characteristic of a developing country while simultaneously implementing smart city technology to maximize efficiency.[133] Mukesh Aghi, president of the U.S.-India Business Council remarked that

> [w]hile we are trying to bring [twenty-first] century technology, we also need to sort out some [nineteenth] century challenges in Ajmer . . . . Basic services like sanitation, health, roads and electricity have not kept up with the pace of growth in these old cities.[134] We can leverage smart technology to leapfrog some of these problems.[135]

The program was met with confusion by Indian citizens.[136] For most, the term smart city remains foreign.[137] A retired schoolteacher who runs a city cleanliness drive called "My Clean School" pleaded, "Can we first work toward becoming a functioning city before aspiring to be a smart city?"[138] The primary barrier in achieving Modi's lofty goals has been financing.[139] Modi, like many other world leaders, looked toward the private sector to fund the majority of the project.[140]

At the highest level of government, supranational bodies like the EU have embraced smart technology to collectively pull Member States into compliance with green initiatives and gain energy independence.[141] Energy security and affordability combined with climate change create one of the

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[131] *Id.*
[132] *Id.*
[133] *Id.*
[134] Lakshmi, *supra* note 128.
[135] *Id.*
[136] *Id.*
[137] *Id.*
[138] *Id.*
[139] *Id.*
[140] Lakshmi, *supra* note 128.
[141] Rafael Leal-Arcas et al., *Smart Grids in the European Union: Assessing Energy Security, Regulation & Social and Ethical Considerations*, 24 COLUM. J. EUR. L. 293, 296–97, 301 (2018).

most significant challenges facing the world.[142] Both prongs of the problem point towards clean, renewable energies. Collectively, the EU is looking towards decentralizing the domestic electrical grids to create more efficient smart grids.[143] However, the creation of an infrastructure that will support a change to clean energy and the economic forces combating this change have proved formidable.[144] Regardless, the creation of smart grids is crucial to the EU's low-carbon transition.[145] EU energy policy is managed by a collaboration of Member State governments and supranational institutions.[146] Since 2016, the European Commission has been fostering innovative research to unravel the logistical barriers in the establishment of "prosumer markets,"[147] which utilize low-carbon systems to gain market independence from the unpredictable oil and natural gas markets.[148]

3. Industry

Creating a smart city requires significant resources, far in excess of what is available to local and even national governments.[149] A smart city requires technical expertise (including human and technological capital), proper management, and the financing to support both.[150] To find

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[142] *Id.* at 296.
[143] *Id.* at 299–301.
[144] *Id.* at 316, 320.
[145] *Id.* at 322.
[146] *Id.* at 301.
[147] The term was coined in the 1980s by Alvin Toffler, but has since been used in the legal, economic and management literature. *See* ALVIN TOFFLER, THE THIRD WAVE 11 (1980).
[148] Leal-Arcas et al., *supra* note 141, at 301–02. The role of the energy prosumer was at the core of the 2016 European Commission's legislative proposals on renewable energy and the internal electricity market. This was incorporated in several legislative acts, the most relevant of which is Directive 2018/2001, of the European Parliament and the Council of 11 December 2018 on the Promotion of Electricity from Renewable Energy Sources (Recast), 2018 O.J. (L328) 1–2. It also remains at the core of the "Clean Energy for all Europeans" package, published by the Directorate-General for Energy in 2019, which puts squarely consumers at the heart of the clean energy transition. *See* DIRECTORATE-GEN. FOR ENERGY (EUR. COMM'N), CLEAN ENERGY FOR ALL EUROPEANS 1 (2019).
[149] *See* DELOITTE, *The Challenge of Paying for Smart Cities Projects* 3–4 (2018), https://www2.deloitte.com/content/dam/Deloitte/us/Documents/public-sector/us-ps-the-challenge-of-paying-for-smart-cities-projects.pdf [https://perma.cc/S8A9-NJ9K].
[150] *See* Shoshanna Saxe, *I'm an Engineer, and I'm Not Buying Into 'Smart' Cities*, N.Y. TIMES (July 16, 2019), https://www.nytimes.com/2019/07/16/opinion/smart-cities.html [https://perma.cc/8NDX-47YJ] (making also the point that smart technology is actually not sustainable: "City infrastructure, especially in high-income countries, is designed to last decades or centuries and must always work. Bridges are built to last 100 years, tunnels longer. New technology in 2015 will be outdated before 2020.").

technical expertise, governments usually partner with technology companies.[151] Some governments also rely on technology companies for management and maintenance of the systems after they have been designed and installed.[152] However, attracting technology companies willing to invest in cities is not straightforward, especially for developing economies.[153] In some cases, governments in developing countries have agreed to include concessions about the ownership and use of the data collected through the smart city to lock in the financial support of large companies.[154]

There are a number of cities around the globe that have bolstered their "smart" credentials by collaborating with industry giants.[155] For instance, IBM has been working with Rio de Janeiro,[156] Jakarta,[157] and Madrid;[158] Cisco with Gurugram,[159] Kansas City,[160] and Barcelona;[161]

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[151] Givens & Lam, *supra* note 5, at 843, 870–71.
[152] *Id.*
[153] *See* DELOITTE, *Smart Cities Funding and Financing in Developing Economies* 5–6 (2018), https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Public-Sector/gx-smart-cities-economies.pdf [https://perma.cc/PU9J-WFTF].
[154] *See, e.g.*, KATHARINE ATHA ET AL., CHINA'S SMART CITY DEVELOPMENT: RESEARCH REPORT PREPARED ON BEHALF OF THE U.S.-CHINA ECONOMIC AND SECURITY REVIEW COMMISSION 43 (2020); Nadine Oliver, *Transforming Urban India: PM Modi's Smart City Initiative*, ASIA PAC. FOUND. CAN. (Oct. 3, 2016), https://www.asiapacific.ca/blog/transforming-urban-india-pm-modis-smart-city-initiative [https://perma.cc/6QXL-UFGU].
[155] "Collaborating" is to be understood in the broad sense of partnering, advising, providing technology and physical infrastructure as well as management services. *See, e.g.*, *5 Smart City Examples from Around the Globe*, CITY INNOVATORS, https://cityinnovatorsforum.com/5-smart-city-examples-from-around-the-globe/ [https://perma.cc/GJE5-WHUV] (last visited Mar. 26, 2021).
[156] Natasha Singer, *Mission Control, Built for Cities*, N.Y. TIMES (Mar. 3, 2012), https://www.nytimes.com/2012/03/04/business/ibm-takes-smarter-cities-concept-to-rio-de-janeiro.html [https://perma.cc/4PBD-Q436]. However, the quality of the resulting smart city has been criticized. *See, e.g.*, Christopher Gaffney & Cerianne Robertson, *Smarter than Smart: Rio de Janeiro's Flawed Emergence as a Smart City*, 25 J. URB. TECH. 47, 48 (2018).
[157] *See Jakarta Smart City*, IBM, https://www.ibm.com/case-studies/jakartasmartcity [https://perma.cc/9HCB-67GP] (last visited Mar. 26, 2021).
[158] *See Madrid and IBM Partner on Smarter Cities Project*, ITS INT'L (July 10, 2014), https://www.itsinternational.com/its8/news/madrid-and-ibm-partner-smarter-cities-project [https://perma.cc/5KBM-2P6Z].
[159] *See Gurugram Metropolitan Development Authority (GMDA)*, CISCO, https://www.cisco.com/c/en_in/about/case-study/gmda.html [https://perma.cc/7DRP-NSLR] (last visited Mar. 26, 2021).
[160] Lauren Horwitz, *Smart City Funding Requires Creative Approaches*, CISCO, https://www.cisco.com/c/en/us/solutions/internet-of-things/smart-city-funding.html [https://perma.cc/9TUG-ERU2] (last visited Mar. 26, 2021).
[161] *See Barcelona Co-Innovation Center*, CISCO, https://www.cisco.com/c/m/es_es/innovationcenter/barcelona-en.html [https://perma.cc/B2FR-6UKG] (last visited Mar. 26, 2021).

Microsoft with Taipei[162] and Denver;[163] and Ericsson with Dallas[164] and Stockholm,[165] to name just a few.

Perhaps, the collaboration that recently has attracted the most academic and media attention is that between Toronto Sidewalk Labs (a subsidiary of Alphabet Inc., the parent company of Google), which was aimed at resurrecting the Quayside struggling neighborhood into a bastion of twenty-first century technology and sustainability.[166] The partnership, Toronto's Quayside Project,[167] has become a cautionary tale of a developed city's attempt at reshaping its streets with modern technology. In fact, the Quayside Project was scrapped by Sidewalk Labs in May 2020, after public pushback unraveled from the misallocation of funds and serious security concerns that have become common characteristics of smart city projects.[168]

While Canada is certainly not known for levels of pollution reaching the severity of their neighbors to the south, Toronto Public Health estimates that air pollution in Toronto "currently gives rise to 1,300

[162] *See Connecting Street Lights in Taipei Saves Money, Boosts Safety*, MICROSOFT (May 24, 2019), https://customers.microsoft.com/en-us/story/724998-city-of-taipei-azure-aaeon-taiwan [https://perma.cc/5NPF-WW9T].

[163] *See Denver's Pioneering Smart City Program Improves Public Safety, Mobility, and Health*, MICROSOFT (Mar. 26, 2019), https://customers.microsoft.com/en-us/story/city-and-county-denver-government-azure [https://perma.cc/4BTM-R4VQ].

[164] Courtney Bjorlin, *Ericsson to Implement Smart City Technology in Dallas*, IOT WORLD TODAY (Jan. 19, 2018), https://www.iotworldtoday.com/2018/01/19/ericsson-implement-smart-city-technology-dallas/ [https://perma.cc/W5BH-CYUB].

[165] Daniel Paska, *Using Data for Good: Digitalized Water for Smart Cities*, ERICSSON BLOG (Nov. 21, 2018), https://www.ericsson.com/en/blog/2018/11/using-data-for-good-digitalized-water-for-smart-cities [https://perma.cc/7K3W-CZDZ].

[166] Brian J. Barth, *Death of a Smart City*, ONEZERO (Aug. 12, 2020), https://onezero.medium.com/how-a-band-of-activists-and-one-tech-billionaire-beat-alphabets-smart-city-de19afb5d69e [https://perma.cc/EM4Z-QFMU].

[167] *Id.*

[168] In May 2020, Sidewalk withdrew from its partnership with Waterfront Toronto citing economic uncertainty caused by the COVID-19 pandemic. *See* Daniel L. Doctoroff, *Why We're No Longer Pursuing the Quayside Project—and What's Next for Sidewalk Labs*, SIDEWALK TALK (May 7, 2020), https://medium.com/sidewalk-talk/why-were-no-longer-pursuing-the-quayside-project-and-what-s-next-for-sidewalk-labs-9a61de3fee3a [https://perma.cc/S3KD-E4BZ]. However, its downfall has been linked to poor data and decision-making governance rather than the reasons cited by Google. *See* Ian Austen & Daisuke Wakabayashi, *The City of the Future in Toronto? Not Now, Google Sibling Says*, N.Y. TIMES (May 8, 2020), at A18; Blayne Haggart & Natasha Tusikov, *Sidewalk Labs' Smart-City Plans for Toronto Are Dead. What's Next?*, THE CONVERSATION (May 8, 2020), https://theconversation.com/sidewalk-labs-smart-city-plans-for-toronto-are-dead-whats-next-138175 [https://perma.cc/6ZZX-G6C7].

premature deaths and 3,550 hospitalizations annually."[169] In response, the citizens of Toronto, and Canada in general, are calling for more aggressive government action on climate change.[170] A 2019 Ipsos-Reid survey found that "75[%] of respondents said Canada needs to do more to address climate change."[171]

Among polluters in Toronto, homes and traffic are some of the highest contributors.[172] Through the Quayside project, Toronto had sought to create an example of varying initiatives that would have reduced pollution. These included energy-efficient buildings inspired by the global "Passive House" movement,[173] digital management tools that act as "Schedulers" to actively ensure buildings are operating in the most efficient manner,[174] a decentralized energy grid running entirely off of renewables,[175] and a digital stormwater management system that captures and reuses stormwater that might otherwise contaminate the Don River basin.[176] Outside of homes and businesses, Toronto sought to use a series of approaches to reduce traffic congestion and transportation pollution, including: expansion of traditional public transportation and enhancement of pedestrian and biker-friendly streets and ride-hailing and self-driving vehicles. Most importantly, Toronto uses real time freight and passenger vehicle management tools utilizing sensors around Quayside to efficiently direct traffic.[177] Through implementation of these technologies, the greenhouse gas emissions in the Quayside neighborhood of Toronto were promised to drop by eighty-nine percent.[178]

As will be discussed further below,[179] the Quayside Project did not fall through because any of these goals were unattainable. Each of these initiatives have been implemented successfully in other cities and have resulted in a reduction in pollution.[180] Rather, the failure lay in governance

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[169] TORONTO PUB. HEALTH, PATH TO HEALTHIER AIR: TORONTO AIR POLLUTION BURDEN OF ILLNESS UPDATE 2 (2014).
[170] *'Silent Majority' of Canadians Want More Government Action on Climate Change*, CBC NEWS (Feb. 1, 2019), https://www.cbc.ca/news/technology/what-on-earth-newsletter-climate-change-action-1.5000581 [https://perma.cc/U5LJ-R9Q9].
[171] *Id.*
[172] TORONTO PUB. HEALTH, *supra* note 169, at 3–6, 9.
[173] SIDEWALK LABS, TORONTO TOMORROW, THE PLANS 200 (2019).
[174] TORONTO PUB. HEALTH, *supra* note 169, at 44.
[175] *Id.*
[176] *Id.* at 210, 243.
[177] *Id.*
[178] SIDEWALK TORONTO, *supra* note 105.
[179] *See infra* notes 211–39 and accompanying text.
[180] The German "passive house" movement has traveled around the world. In 2018, Kansas

gaps within the project. Following the theme of governance, the next section provides an overview of the critiques that have been moved to smart cities[181] and will conclude with an analysis of the accountability gap that is often found in smart city projects.[182]

III. GOVERNANCE CRITIQUES TO SMART CITIES: THE RISE OF THE CITY SKEPTICS

Smart cities have the potential to tackle certain urban and environmental challenges, but a growing body of literature has been raising alarms against taking at face value the promise that smart cities will *necessarily* improve the lives of their inhabitants and the delivery of public goods.[183] Recent events, such as the Toronto Quayside Project— discussed below— demonstrate that when smart city technology over-promises, it risks failing.[184] It is because of smart city technologies' shortfalls, the public's misled expectations, and the extreme concerns about privacy, transparency, and accountability, that CityLab, the Atlantic's publication devoted to the future of cities, declared 2018 "the year of the smart city skeptic."[185]

The efficiencies and streamlined solutions that smart cities offer carry certain serious governance risks. These can be grouped in three major categories. First, and topping the charts for the most quoted problem associated with smart cities, is the loss of privacy.[186] As Manheim and Kaplan put it in their article warning about the risks to privacy and democracy posed by the increasing reliance on artificial intelligence, "[w]e

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City developed Second + Delaware, a 276-unit apartment community that stands as the largest project certified to passive house standards. *The Story of the Largest Passive House Building in the World*, SECOND + DEL., CISION (Aug. 17, 2020), https://www.prnewswire.com/news-releases/the-story-of-the-largest-passive-house-building-in-the-world-301113395.html [https://perma.cc/X4TK-6PLT]. A decentralized energy grid in Frankfurt progresses annually toward their goal of a 100% renewable energy supply. *See Cities Lead the Way on Clean and Decentralized Energy Solutions*, INT'L ENERGY AGENCY (Apr. 6, 2017), https://www.iea.org/news/cities-lead-the-way-on-clean-and-decentralized-energy-solutions [https://perma.cc/3NNR-QWP7]. In Chicago, City Digital successfully launched a digital stormwater management system as part of a broader urban sensor initiative. Sean Thorton, *How a Smart City Tackles Rainfall*, ASH CTR., HARV. KENNEDY SCH. (Jan. 3, 2017), https://datasmart.ash.harvard.edu/news/article/how-a-smart-city-tackles-rainfall-956 [https://perma.cc/7646-9LDZ].

[181] *See infra* notes 183–210 and accompanying text.

[182] *See infra* notes 211–39 and accompanying text.

[183] *See* Givens & Lam, *supra* note 5, at 829.

[184] *See infra* notes 215–22 and accompanying text.

[185] *See* Laura Bliss, *2018 Was the Year of the Smart City Skeptic*, CITYLAB (Dec. 27, 2018), https://www.citylab.com/transportation/2018/12/smart-city-uber-google-facebook-technology-startup-solutions/579025/ [https://perma.cc/VRE8-NDH5].

[186] *See* Givens & Lam, *supra* note 5.

generate an enormous amount of data every day. Keeping it private is a herculean task."[187] The data that we generate autonomously—our digital footprints[188]—are compounded with the data that the smart city collects about us (e.g., when CCTV cameras record someone walking down the street), and with the data about us that others share, i.e., our data shadows.[189] As Kitchin notes, all these data points are phenomenally valuable for dataveillance[190] and geosurveillance,[191] and "have profound social, political, ethical consequences."[192] The IoT devices (which, as noted above, never sleep), capture the data that make the smart city function, but also make us vulnerable to identification, surveillance, manipulation (or nudging, if we want to use the more academic term), and, potentially, shaping of our free will.[193] A related problem is that of informed consent. Several critics have noted that, in smart cities, notices of data collection and opportunities to decline are not meaningful.[194] To put it in context, a noticeboard indicating that "live facial recognition" is being deployed in the shopping center where I happen to be,[195] does not mean that I

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[187] Manheim & Kaplan, *supra* note 19, at 106, 118–19.
[188] For instance, when we "check in" at a restaurant using Facebook, we create a digital footprint that positions us in a specific location at a particular time. *See* Kristina Ericksen, *Your Digital Footprint: What Is It and How You Can Manage It?*, RASMUSSEN U. (May 16, 2020), https://www.rasmussen.edu/student-experience/college-life/what-is-digital-footprint/ [https://perma.cc/LQ8K-G4ZG].
[189] A digital shadow is the sum of the data about us that other people share, such as when a friend shares on social media a picture of you. That image of you now exists in the cyberspace whether you know of it or not. Logan Daley, *Digital Footprints and Shadows*, MEDIUM: DATA DRIVEN INVESTOR (Jan. 6, 2020), https://medium.com/datadriveninvestor/footprints-and-shadows-1453da461d2d [https://perma.cc/BQE2-G8KW].
[190] Dataveillance is a type of ongoing surveillance enacted through monitoring, aggregating, and processing of data and metadata. *See* Rita Raley, *Dataveillance and Countervailance*, *in* "RAW DATA" IS AN OXYMORON 121–46, 124 (Lisa Gitelman ed., 2013).
[191] Geosurveillance is another type of surveillance that tracks the location and movement of people, vehicles, etc., and which monitors interactions across space. *See* Jeremy W. Crampton, *The Role of Geosurveillance and Security in the Politics of Fear*, *in* GEOSPATIAL TECHNOLOGIES AND HOMELAND SECURITY: RESEARCH FRONTIERS AND FUTURE CHALLENGES 283–300, 290 (Daniel Sui ed., 2008).
[192] Rob Kitchin, *Data-driven Urbanism*, *in* DATA AND THE CITY 44–56, 49 (Rob Kitchin et al. eds., 2018).
[193] Manheim & Kaplan, *supra* note 19, at 130–31.
[194] *See, e.g.*, Emilie Scott, *The Trouble with Informed Consent in Smart Cities*, INT'L ASS'N OF PRIV. PROF. (IAPP) (Feb. 28, 2019), https://iapp.org/news/a/the-trouble-with-informed-consent-in-smart-cities/ [https://perma.cc/SL45-Y9TA]; Lilian Edwards, *Privacy, Security and Data Protection in Smart Cities: A Critical EU Law Perspective*, 2 EUR. DATA PROT. L. REV. 28, 53 (2016).
[195] Antoaneta Roussi, *Resisting the Rise of Facial Recognition*, NATURE (Nov. 19, 2020), https://www.nature.com/articles/d41586-020-03188-2 [https://perma.cc/6JFE-8K8X].

actually consented to my image being processed through facial recognition technology. As another example, although I may consent to the collection of my data for the purposes of, for instance, monitoring traffic flows or for more efficient electricity distribution, I have not also consented to those data being used to nudge me to use public transport or change my home light bulbs to more energy-efficient ones. Or have I?[196] A related, mind-bending question is: Who owns the data collected? Is it mine? Does it belong to the city or to the technology company whose products or services the smart city has employed?[197]

The second category of risks is linked to the fact that, as noted in the discussion about Pillar III,[198] the public sector alone does not have the necessary resources either to retrofit technological solutions onto existing urban infrastructure or to fund smart-from-the-start centers. This makes collaboration between the public and private sectors a necessity. However, public-private collaboration increases certain dangers. One such danger is the corporatization of public services, which is problematic when it comes to public governance because private and public interests are not always—if ever—aligned.[199] A growing body of literature warns that citizens are not mere consumers of data-driven services, and that reducing them to that status curbs their relevance in the democratic process.[200] Corporatization of public services also exposes cities to technological nudges; the private sector has a commercial interest to entrench its own technological products in the infrastructure for the city, which raises the risk of capture.[201]

The third category of risk that may weaken governance is the datafication of citizens.[202] Although, as noted above, people are critical

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[196] Sofia Ranchordás, *Nudging Citizens through Technology in Smart Cities*, 34 INT'L REV. L. COMPUTERS & TECH. 254, 266 (2020).
[197] Robert Brauneis & Ellen P. Goodman, *Algorithmic Transparency for the Smart City*, 20 YALE J.L. & TECH. 103, 118 (2018).
[198] *See infra* notes 149–52 and accompanying text.
[199] HALEGOUA, *supra* note 14, at 18; KITCHIN ET AL., *supra* note 16, at 5.
[200] *See, e.g.*, Paolo Cardullo & Rob Kitchin, *Smart Urbanism and Smart Citizenship: The Neoliberal Logic of 'Citizen-Focused' Smart Cities in Europe*, 37 ENV'T & PLAN. C: POL. & SPACE 813–30 (2019); Sofia Ranchordás, *Citizens as Consumers in the Data Economy: The Case of Smart Cities*, 7 J. EUR. CONSUMER & MKT. L., 154–61 (2018); Sofia Ranchordás, *Law and Autonomous Systems Series: Cities as Corporations? The Privatization of Cities and the Automation of Local Law*, OXFORD BUS. L. BLOG (Apr. 18, 2018), https://www.law.ox.ac.uk/business-law-blog/blog/2018/04/law-and-autonomous-systems-series-cities-corporations-privatization [https://perma.cc/H8L3-P5DL].
[201] Cardullo & Kitchin, *supra* note 200, at 819.
[202] Broadly, datafication refers to the collective tools, processes, methods, techniques, and technologies used to transform a city to a data-driven

components of the third smart city pillar, some argue that smart city models conceptualize "citizens as passive recipients and information providers of automated data."[203] Data, like artifacts,[204] are not neutral but cultural objects "embedded and integrated within a social system whose logic, rules, and explicit functioning work to determine the new conditions of possibilities of users' lives."[205] Therefore, the insights that smart cities gain from the wealth of information about their citizens are themselves subject to interpretation, shaped by worldviews and biases. As van Dijk colorfully puts it, "[a]utomated data extraction performed on huge piles of metadata generated by social media platforms reveals no more information about specific human behavior than large quantities of sea water yield information about pollution—unless you interpret these data using specific analytical methods guided by a focused query."[206] Datafication also means that political discourse and engagement are translated (and banalized) into social media interactions and number of "likes,"[207] predicted preferences of the "crowd,"[208] or into providing limited feedback

> enterprise. The intensification of datafication is manifested in the radical expansion in the volume, range, variety, and granularity of the data generated about urban environments and citizens, with the aim to quantify the different aspects of urbanity in the modern city.

Bibri & Krogstie, *supra* note 97, at 5 (citations omitted).

[203] HALEGOUA, *supra* note 14, at 134.

[204] Langdon Winner, *Do Artifacts Have Politics?*, 109 DAEDALUS 121, 121–36 (1980).

[205] John Cheney-Lippold, *A New Algorithmic Identity: Soft Biopolitics and the Modulation of Control*, 28 THEORY, CULTURE & SOC'Y 164, 167 (2011).

[206] José van Dijck, *Datafication, Dataism and Dataveillance: Big Data Between Scientific Paradigm and Ideology*, 12 SURVEILLANCE & SOC'Y 197, 201 (2014).

[207] Jay D. Bolter, *Social Media Are Ruining Political Discourse*, ATLANTIC (May 19, 2019), https://www.theatlantic.com/technology/archive/2019/05/why-social-media-ruining-po litical-discourse/589108/ [https://perma.cc/XQU3-TRVA]; Powell, *supra* note 18, at 215–24 (referring to Jodi Dean's notion of communicative capitalism, Powell warns that "the norms of publicity—information, communication, and participation—have come to stand in for the political ends that they were presumed to serve. *In other words, the act of communicating a message has come to stand in for the message itself.* The message is part of a data stream and its most important feature is its circulation. This formulation of communication is important for considering citizenship in the data city. Dean's insight is that the fact of communicating a message, rather than the content of the message itself, has become the most important action. She refers to a 'communicative capitalism', which 'designates that form of late capitalism in which values heralded as central to democracy take material form in networked communications technologies'. These values include access, inclusion, discussion and participation—in other words, the foundations of expectations of openness and transparency. They are realized through the expansion, intensification and interconnection of global telecommunications.") (emphasis added).

[208] Steven Poole, *The Truth About Smart Cities: 'In the End, They Will Destroy Democracy,'*

about predetermined options.[209] Governance in democratic regimes requires citizens' participation and trust in the institutions, which should not be confused with the clickbait politics.[210]

IV. SMART CITIES AND THE ACCOUNTABILITY GAP

The critique to smart cities extends to the existence of an accountability gap for decisions based on smart city technologies.[211] As Sofia Ranchordás states "[s]mart cities embody two new governance trends: the reliance on an entanglement of smart technologies to advance the public good and the growing collaboration between the public and the private sectors to develop innovative projects with limited costs."[212] However, ubiquitous technologies capable of surveillance can cause the public to mistrust smart city projects.[213] This is linked to the erosion of transparency and accountability, which are critical fixtures in democratic systems.[214]

To illustrate how accountability gaps may damage smart cities, let us return to the Toronto Quayside Project. As mentioned, the project has now fallen through and the failure lay—at least in part—in the governance of the project, despite it being formally attributed to the pandemic.[215] What besieged the project from the outset was the governance of data.[216] The question of how the data collected from the residents and visitors of the Quayside neighborhood was to be kept and managed

GUARDIAN (Dec. 17, 2014), https://www.theguardian.com/cities/2014/dec/17/truth-smart-city-destroy-democracy-urban-thinkers-buzzphrase [https://perma.cc/S4HJ-8KLS].

[209] Cardullo & Kitchin, *supra* note 200, at 816.

[210] Powell, *supra* note 18, at 215; *contra* MAYER-SCHÖNBERGER & CUKIER, *supra* note 18, at 198.

[211] There is a growing body of literature exploring how governance needs to adapt in the context of Big Data. *See, e.g.*, HALEGOUA, *supra* note 14, at 135; Manheim & Kaplan, *supra* note 18, at 106; Ranchordás & Klop, *supra* note 19, at 245–73; Meijer & Bolívar, *supra* note 13, at 392–408.

[212] Ranchordás, *supra* note 196, at 261. *See* Matthew Jewell, *Contesting the Decision: Living in (and Living with) the Smart City*, 32 INT'L REV. L., COMPUTERS & TECH., 210–29 (2018).

[213] Kim Hart & Aïda Amer, *The Privacy Worries with Smart Cities*, AXIOS (Dec. 24, 2019), https://www.axios.com/toronto-sidewalk-labs-smart-cities-stalled-distrust-big-tech-government-95cd21c4-39f6-4c9e-ae98-bc393ca85e75.html [https://perma.cc/JR5P-UUZV].

[214] Marius Rohde Johannessen & Lasse Berntzen, *The Transparent Smart City: How City Councils and City Administrations Can Apply Smart Technology for Increased Transparency—with Case Evidence from Norway*, *in* SMART TECHNOLOGIES FOR SMART GOVERNMENTS: TRANSPARENCY, EFFICIENCY AND ORGANIZATIONAL ISSUES 67, 68–69 (Manuel Pedro Rodríguez Bolívar ed., 2018).

[215] Saxe, *supra* note 150; Doctoroff, *supra* note 168.

[216] Barth, *supra* note 166.

was never resolved. On one side were those who pushed for data to be anonymized at source to protect the privacy of anybody who interacted with the unprecedented number of sensors and other data collecting devices planned to be embedded in the physical infrastructure.[217] On the other was Sidewalk (and Alphabet behind it) offering alternative data governance models, including a civic data trust.[218] In October 2018, matters came to a head when Ann Cavoukian, formerly Ontario's information and privacy commissioner who famously collaborated to the conceptualization of "privacy by design,"[219] left Sidewalk Labs, for which she was a consultant. Her request that data collected within Quayside be de-identified at the point of data collection was not going to be implemented, and so she resigned. In her words: "I wanted this to become a smart city of privacy—not a smart city of surveillance."[220] Concerns about data governance triggered activism[221] which some say, eventually, brought the entire project to an end.[222]

To identify the accountability gap, it is necessary to explain what accountability means.[223] Several commentators speak of different forms

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[217] Sidney Fussell, *The City of the Future Is a Data-Collection Machine*, ATLANTIC (Nov. 21, 2018), https://www.theatlantic.com/technology/archive/2018/11/google-sidewalk-labs/575551/ [https://perma.cc/P5AV-44HB].

[218] Ryan Johnston, *Sidewalk Labs Proposes Third-Party Data Storage for Quayside Project*, STATESCOOP (Oct. 16, 2018), https://statescoop.com/sidewalk-labs-quayside-civic-data-trust/ [https://perma.cc/6URJ-TNTX].

[219] The seven principles of Privacy by Design are: 1. Proactive not Reactive; 2. Privacy as Default; 3. Privacy Embedded into Design; 4. Full Functionality; 5. End-to-End Security; 6. Visibility and Transparency; and 7. Respect for User Privacy. ANN CAVOUKIAN, PRIVACY BY DESIGN: THE 7 FOUNDATIONAL PRINCIPLES, PRIVACY & BIG DATA INST. (2011).

[220] Josh O'Kane, *Privacy Expert Ann Cavoukian Resigns from Sidewalk Toronto Smart-City Project: 'I Had No Other Choice,'* GLOBE & MAIL (Oct. 21, 2018), https://www.theglobeandmail.com/business/article-privacy-expert-ann-cavoukian-resigns-from-sidewalk-toronto-smart-city/ [https://perma.cc/W62P-MS7G].

[221] Activism saw, amongst others, the Canadian Civil Liberties Association bringing a lawsuit against Waterfront Toronto Revitalization Corporation, an agency set up to "implement a plan that enhances the economic, social and cultural value of the land of the waterfront area . . . in a fiscally and environmentally responsible manner." Toronto Waterfront Revitalization Corporation Act, 2002, S.O. 2002, c. 28, s. 3(1). Notice of Application to Divisional Court for Judicial Review at 1, 2, 3, 4, Corp. of the Canadian Civ. Liberties Ass'n v. Waterfront Toronto Revitalization Project (Ont. Super. Ct. of Just. Apr. 16, 2019), Case No. 211/19, https://ccla.org/cclanewsite/wp-content/uploads/2019/04/Notice-of-Application-CCLA-and-Lester-Brown.pdf.

[222] Barth, *supra* note 166.

[223] The author bases her view on her previous unpublished research. *See* Iria Giuffrida, ACCOUNTABILITY AND THE REFORM OF EUROPEAN GOVERNANCE: COMITOLOGY AND

or types of accountability,[224] but accountability is best considered as a single concept based on the "*relationship between the power-wielder and the accountability-holder, in which the power-wielder has an obligation to explain and justify its conduct, and the accountability-holder has the power to probe and judge the account*."[225] It follows that "[t]he essence of this relationship is the day-to-day evaluation and assessment of the exercise of public powers,"[226] which can take place through different mechanisms. These include direct electoral mechanisms;[227] political institutional mechanisms;[228] administrative mechanisms;[229] judicial and quasi-judicial mechanisms;[230] and softer mechanisms such as appraisal by civil society, stakeholders, and the scientific community.[231] Accountability is therefore "not only about 'stopping' the powers from being abused (retrospective function), but it is also about 'facilitating' the exercise of power by ensuring that trust and reliability of the institutions are maintained throughout time and ensuring that all the actors in the process learn from it (prospective function)."[232] This suggests that accountability is a dynamic process that is capable of accommodating the nature of the actors involved, the political and institutional contexts in which accountability arises, the type of the account given, and the sort of consequences that flow from the account-holder's exercise of accountability.[233]

With this in mind, looking back at the Toronto Quayside Project there was a disconnect between the need of Sidewalk Labs (the power wielder) to gather data to build the promised environmentally sound

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AGENCIES IN THE REGULATION OF GM-FOOD AND CHEMICALS (2009) (Ph.D. dissertation, Queen Mary, University of London) (on file with the British Library).
[224] *Id.* at 108–11.
[225] *Id.* at 112.
[226] *Id.* at 113.
[227] *Id.* at 138. These mechanisms refer to voting somebody out of an elected function.
[228] *Id.* at 138–40. These include the power to "hire and fire" as well as the power to participate and influence decision-making processes.
[229] Giuffrida, *supra* note 223, at 143–44. Here, one would include internal and external audits as well as managerial mechanisms such as measuring actions by reference to standards for performance and benchmarks.
[230] *Id.* at 144–48. These mechanisms range from judicial review, to the investigations of Ombudsmen and independent committees of inquiry.
[231] *Id.* at 148–50. The mechanisms covered by this latter category include more or less structured participation in decisions affecting the smart city as well as the contributions from grassroots organizations and civil society. Although these groups may not have a legal right to demand an account, their participation in governance has become critical.
[232] *Id.* at 115.
[233] *Id.* at 104–05.

smart city and that of the people who would have ultimately lived in it (the account holders). On one hand, the retrospective function of accountability can be said to have occurred in the sense that the accounts demanded by civil society and the scientific community contributed to the project being abandoned. However, on the other hand, accountability has an important prospective and facilitating function that, in this instance, was absent. Essentially, there was not sufficient trust between power wielder and account holders. For future projects in democratic countries, this can be a problem. As Givens and Lam acknowledge, this lack of trust can be built through increased transparency, education, and open dialogue, but this takes time.[234] However, they warn us that delays in developing smart cities that incorporate the values of liberal democracies can empower authoritarian regimes to advance their own vision of smart cities.[235] And in the end, this risks being the only type of smart city available.[236]

Going forward, public and private project leaders need to include in their smart city projects a plan on how to address accountability in the prospective and retrospective sense. Aware of the fact that accountability is a dynamic process, it is critical that project leaders involve local residents, grassroots organizations, and civil society representing those groups who could be potentially marginalized by the heavy reliance on technology. These groups should take part in the decision-making processes through meaningful participation.[237] Certainly, they should start by asking what citizens want[238] and not be blinkered by what they think citizens want. Citizens, grassroots organizations, and civil society for their part, should ask questions about who collects their data, who has access to it, and how their data will be used.[239] It takes a proverbial village to build a smart city.

CONCLUSION

This Article has offered an overview of the sustainability claims that smart cities offer. They are many and promising. However, as the

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[234] Givens & Lam, *supra* note 5, at 844.
[235] *Id.*
[236] *Id.* at 844, 877.
[237] Ranchordás & Klop, *supra* note 19, at 264.
[238] HALEGOUA, *supra* note 14, at 134 (citing Catherine Mulligan, *Citizen Engagement in Smart Cities*, *in* SMART CITIZENS 83–86 (Drew Hemment & Anthony Townsend eds., 2013)).
[239] Bennat Berger, *Sidewalk Labs' Failure and the Future of Smart Cities*, TRIPLE PUNDIT (June 16, 2020), https://www.triplepundit.com/story/2020/sidewalk-labs-failure-smart-cities/120616 [https://perma.cc/GG7R-ALFC].

literature reviewed has demonstrated, smart cities gain phenomenal insights about their inhabitants and the environment around them at certain costs. These include the loss of privacy, the corporatization of public services, the privatization of citizens' data, and the datafication of citizens. A further cost, less discussed in the literature, is the challenge in the governance of smart cities to establish clear lines of accountability for decisions based on smart city technologies. In democratic societies, these costs are eroding the public trust on smart cities, and in at least one instance, the lack of trust has contributed to, if not caused, the shelving of a smart city.[240]

There is a vibrant interdisciplinary literature that is tackling these issues.[241] This Article contributes to it by advancing a dynamic conceptualization of accountability. Accountability is not a static, one-off instance in which power-wielders are held to account, but it is integral to the governance process.

[240] Doctoroff, *supra* note 168.
[241] *See supra* text accompanying note 211.