

16. Greener Cities: Intellectual Property and Data in Sustainable Smart Cities

Natasha Tusikov

Human-induced climate change has ‘caused widespread adverse impacts to nature and people’ with ‘the most vulnerable people and systems [being] disproportionately affected,’ concludes the United Nation’s Intergovernmental Panel on Climate Change (IPCC) report released in February 2022.¹ Because of the role of the global energy system in causing climate change, the International Energy Agency has called for a moratorium on new oil and gas projects and new coal mines, and for an immediate massive shift to renewable energy and alternative transportation technologies.² Addressing climate change requires swift and coordinated responses from states, corporate actors, and civil society at the international, domestic, and local levels to decarbonize the economy and shift to renewable technologies. Humanity, argues regulatory scholar Peter Drahos, needs to move into ‘survival governance,’ which he describes as the necessary intervention, whether by state or non-state actors, to decarbonize economies and preserve ecological systems to avoid irreversible collapse.³

The climate crisis places renewed attention on cities, both because cities are particularly vulnerable to some effects from climate change and as cities can play a key role in mitigation. A growing proportion of people worldwide live in cities; the United Nations forecasts that 68 percent of the global population will reside in cities by 2050, an increase from the 2021 level of 56 percent with most of the increase forecast for Africa and Asia.⁴ Increasing urbanization is a climate change problem as cities consume more than two-thirds of the world’s energy and account for more than 70% of global carbon dioxide emissions.⁵ Cities, particularly those in developing countries, are especially vulnerable to climate change, including extreme weather events, flooding and droughts, heatwaves, and sea-level rise.⁶ Climate change is altering the frequency and severity of weather events like hurricanes with cities forced to address infrastructural challenges, including energy grid resilience to avoid water shortages

¹ H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds), *IPCC 2022, Climate Change 2022: Impacts, Adaptation, and Vulnerability*. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge (UK): Cambridge University Press, 2022 at vii, https://report.ipcc.ch/ar6/wg2/IPCC_AR6_WGII_FullReport.pdf.

² International Energy Agency, *Net Zero by 2050: A Roadmap for the Global Energy Sector*, 2021, <https://www.iea.org/reports/net-zero-by-2050>.

³ Peter Drahos, *Survival Governance: Energy and Climate in the Chinese Century*, New York (US): Oxford University Press, 2021.

⁴ UNHabitat, *World Cities Report 2022: Envisaging the Future of Cities*, Nairobi: UN-Habitat, 2022 at xv, <https://unhabitat.org/wcr/>.

⁵ United Nations Climate Change, ‘Urban Climate Action Is Crucial to Bend the Emissions Curve’ 5 October 2020, <https://unfccc.int/news/urban-climate-action-is-crucial-to-bend-the-emissions-curve>.

⁶ United Nations, Resolution adopted by the General Assembly on 23 December 2016 [without reference to a Main Committee (A/71/L.23)] 71/256. New Urban Agenda, 2017.

and energy blackouts.⁷ Increasing challenges of urbanization and climate change effects intensify problems in cities with poor urban planning and failing or fragile infrastructure.

Cities also represent sites of innovation, citizen engagement, and market demand for decarbonizing solutions. Drahos argues that cities ‘represent huge focal points of technological convergence, infrastructure projects, and systems solutions,’ which given the scale of large cities, ‘give the world a realistic chance of avoiding the worst climate change scenarios.’⁸ The United Nations explicitly recognizes the importance of cities in its 2015 Sustainable Development Goals (SDG), specifically in SDG 11: Make cities and human settlements inclusive, safe, resilient and sustainable.⁹ To implement the SDG 11 and other sustainable development goals with an urban dimension, the UN General Assembly endorsed the New Urban Agenda in December 2016. Cities have a key role to play in ensuring environmental sustainability by promoting clean energy, sustainable land and resources use, and mitigating and adapting to climate change.¹⁰

Proponents of smart cities, understood as cities that integrate information communications technologies into physical infrastructure for a real-time capacity to collect and act upon data, contend that such cities have a special role to play in addressing climate change, especially regarding the shift to renewable energy technologies and expansion of sustainable transportation.¹¹ Smart cities that focus on energy management and renewable energy, for example, may provide solutions to overloaded energy grids and energy blackouts,¹² as well as implement sustainable transportation, treat wastewater, capture stormwater, and employ building standards that lessen greenhouse gas emissions.¹³ Advocates argue

⁷ Renee Obringer and Roshanak Nateghi, ‘What makes a city ‘smart’ in the Anthropocene? A critical review of smart cities under climate change’ (2021) 75 *Sustainable Cities and Society*, 1-12.

⁸ Peter Drahos, *Survival Governance: Energy and Climate in the Chinese Century*, New York (US): Oxford University Press, 2021 at 15 and 201. Drahos makes this argument specifically in relation to cities in China. Of the four states – China, India, the European Union, and the United States – that he contends have the leadership and large domestic market capable of catalyzing global action against climate change, Drahos regards China as the “least improbable leader” because of its ability to make economic and governance changes rapidly and to experiment with renewable energy (at 216). China, he argues, is alone in its deployment of cities on a massive scale to ‘assess whether technologies in renewable energy, power transmission, electrification of transport and industrial processes, and energy storage can be synthesized into proven systems solutions for cities.’ (at 222).

⁹ United Nations, *Transforming our world: the 2030 Agenda for Sustainable Development* 2015, adopted by General Assembly Resolution A/Res/70/1 on 25 September 2015, <https://sdgs.un.org/2030agenda>.

¹⁰ United Nations, *New Urban Agenda*, adopted at the United Nations Conference on Housing and Sustainable Urban Development, (Habitat III), Quito, Ecuador, October 20 2016, endorsed by UN General Assembly 71 Sess. December 23, 2016, <https://habitat3.org/the-new-urban-agenda/> at 8.

¹¹ Giffinger et al. *Smart Cities- Ranking of European Medium-Sized Cities*, Vienna: Centre of Regional Science, Vienna University, 2007 cited in Renee Obringer and Roshanak Nateghi, ‘What makes a city ‘smart’ in the Anthropocene? A critical review of smart cities under climate change’ (2021) 75 *Sustainable Cities and Society*, 1-12, at 2.

¹² Renee Obringer and Roshanak Nateghi, ‘What makes a city ‘smart’ in the Anthropocene? A critical review of smart cities under climate change’ (2021) 75 *Sustainable Cities and Society*, 1-12; Tan Yigitcanlar and Didem Dizdaroglu ‘Ecological approaches in planning for sustainable cities: A review of the literature’ (2015) 1(2) *Global Journal of Environmental Science and Management*, 159-188.

¹³ United Nations. Urban Planning Law for Climate Smart Cities: Urban Law Module Law and Climate Change Toolkit. UN Habitat. United Nations Human Settlements Programme, 2022, <https://unhabitat.org/urban-planning-law-for-climate-smart-cities-the-urban-law-module-of-the-law-and-climate-change>.

Tusikov, N. (2024) Greener Cities: Intellectual Property and Data in Sustainable Smart Cities. In Bitu Amani, Caroline Ncube, and Matthew Rimmer, eds. *The Elgar Companion to Intellectual Property and the Sustainable Development Goals*. Pp. 373-394. Cheltenham, UK: Edward Elgar.

smart cities can achieve sustainability goals by delivering services in an ‘adaptable, reliable, scalable, accessible and resilient way.’¹⁴

To address climate change, smart cities could capitalize upon opportunities from sustainable transportation and renewable energy technologies,¹⁵ as well as clean technologies, commonly termed ‘cleantech’ that reduce resource consumption and mitigate climate change impacts. Cleantech, according to the Canadian government, refers to:

any good or service designed with the primary purpose of contributing to remediating or preventing any type of environmental damage; any service that is less polluting or more resource efficient than equivalent normal products that furnish a similar utility.¹⁶

Cleantech must be rapidly and broadly implemented at the global level to catalyze the essential transition from fossil fuels to renewable energy. UN Secretary-General Guterres argues that renewable energy technologies, like battery storage, be treated as ‘essential and freely-available global public goods’¹⁷ to ensure the rapid, global manufacture and distribution of renewable energy technologies. Such a move, however, necessitates removing ‘obstacles to knowledge sharing and technological transfer – including intellectual property constraints.’¹⁸

Companies, largely those in the Global North, are the obstacles in this case as they disproportionately control the intellectual property rights on the technologies essential to addressing climate change, typically using patents that provide protection to novel inventions.¹⁹ Intellectual property and climate change are therefore ‘intertwined.’²⁰ As a result, technologies critical to addressing climate change are more costly and difficult to access, forming barriers that are especially problematic in developing countries that often face more immediate and significant climate change effects.²¹

¹⁴ Evelin Priscila Trindade, Marcus Phoebe Farias Hinnig, Eduardo Moreira da Costa, Jamile Sabatini Marques, Rogério Cid Bastos and Tan Yigitcanlar, ‘Sustainable development of smart cities: a systematic review of the literature’ (2017) 3(11) *Journal of Open Innovation: Technology, Market, and Complexity* 1-14 at 4, citing the work of M. Dhingra and S. Chattopadhyay ‘Advancing smartness of traditional settlements-case analysis of Indian and Arab old cities’ (2016) 5(2) *International Journal of Sustainable Built Environment*, 549-563.

¹⁵ United Nations, *New Urban Agenda*, adopted at the United Nations Conference on Housing and Sustainable Urban Development, (Habitat III), Quito, Ecuador, October 20 2016, endorsed by UN General Assembly 71 Sess. December 23, 2016, <https://habitat3.org/the-new-urban-agenda/>.

¹⁶ Government of Canada, *Clean Technology Data Strategy* (2022), <https://ised-isde.canada.ca/site/clean-growth-hub/en/clean-technology-data-strategy>.

¹⁷ António Guterres (UN Secretary-General) Remarks at Press Conference on WMO State of the Global Climate 2021 Report, United Nations Secretary-General António Guterres, 2022, <https://media.un.org/en/asset/k1q/k1qn00cy8a>

¹⁸ Ibid.

¹⁹ Matthew Rimmer, *Intellectual Property and Climate Change*, Cheltenham (UK): Edward Elgar, 2011; Soledad Pellicer, Guadalupe Santa, Andres L. Bleda Rafael Maestre, Antonio J. Jara, and Antonia Gomez Skarmeta, ‘A Global Perspective of Smart Cities: A Survey’ (2013) *IEEE Xplore* 439-444, <https://ieeexplore.ieee.org/document/6603712>.

²⁰ Abbe EL Brown, ‘Intellectual property and Climate Change,’ in Rochelle Dreyfuss and Justine Pila (eds.), *The Oxford Handbook of Intellectual Property Law*, New York (US): Oxford University Press, 2017, 958-990 at 990.

²¹ See Sang-Jin Ahn and Ho Young Yoon, ‘‘Green chasm’ in clean-tech for air pollution: Patent evidence of a long innovation cycle and a technological level gap’ (2020) 272 *Journal of Cleaner Production* 1-15; Matthew Rimmer, *Intellectual Property and Climate Change*, Cheltenham (UK): Edward Elgar, 2011.

Tusikov, N. (2024) Greener Cities: Intellectual Property and Data in Sustainable Smart Cities. In Bitu Amani, Caroline Ncube, and Matthew Rimmer, eds. *The Elgar Companion to Intellectual Property and the Sustainable Development Goals*. Pp. 373-394. Cheltenham, UK: Edward Elgar.

This chapter examines smart cities to consider how intellectual property may affect the creation and use of digital technologies to address social problems, particularly climate change. It is guided by the following questions: how might smart cities deliver on the UN's Sustainable Development Goal 11 of inclusive, safe, resilient, and sustainable cities, and secondly, how might intellectual property affect cities' use of technologies to strengthen environmental sustainability? The chapter makes a two-fold argument: public officials who plan and operate smart cities require a critical understanding not only of intellectual property (IP) rights, but also how digital data produced by smart city technologies should be collected, used, and governed. This is because companies employ intellectual property to commercialize their innovations, as well as capture economic value from the production and use of their technologies. Data, meanwhile, is not merely a by-product of the smart city but its constituent element, with significant economic and social value accorded to the capture and commodification of data.²²

To make its argument, the chapter considers the roles of intellectual property and data in the case of Google's 'climate positive' smart city project in Toronto, Canada (cancelled as of May 2020). In this project Google's urban development company Sidewalk Labs won a bid in 2017 to propose a smart city on formerly industrial land on the eastern waterfront of downtown Toronto. The project had nearly two years of public consultation, which offers a wealth of detail on Sidewalk Labs' plans, many of them controversial in terms of privacy and the control over economic benefits from IP stemming from smart city technologies created in the project. Toronto's smart city project, termed 'Quayside' after the project area, usefully highlights the central role that intellectual property plays within smart cities, including enabling technology companies to capture and monetize data flowing from smart city technologies.

The chapter draws upon analysis of primary documents related to the Quayside project, specifically Sidewalk Labs' June 2019 four-volume 1500-page Master Innovation and Development Plan.²³

1. SMART CITIES

1.1 Sustainable smart cities

Studying smart cities is complicated by the absence of a common definition for the concept, as the concept is what some scholars term a 'somewhat nebulous idea.'²⁴ Two principal features characterize smart cities: networks of sensors attached to real-world objects embedded in the urban environment, and networks of communications technologies that enable real-time data collection, streaming and analysis to deliver services and integrate information and physical infrastructure.²⁵ Cities can therefore be considered 'smart' because they are designed to collect, via constant surveillance, data produced within the space, either from the environment or from the people living within the city.²⁶

²² Nick Srnicek, *Platform Capitalism*, Cambridge (UK): Polity, 2017.

²³ Sidewalk Labs, *Toronto Tomorrow: Sidewalk Labs' Master Innovation and Development Plan*, Vols. 0-3, 2019, <https://www.sidewalklabs.com/toronto>.

²⁴ Taylor Shelton, Matthew Zook and Alan Wiig, 'The "Actually Existing Smart City"' (2015) 8, *Cambridge Journal of Regions, Economy and Society*, 13-25 at 13.

²⁵ Lilian Edwards, 'Privacy, Security and Data Protection in Smart Cities: A Critical EU Law Perspective' (2016) 2(31) *European Data Protection Law Review*, 28-58 at 31. See also Albert Meijer and Manuel Pedro Rodríguez Bolívar, 'Governing the Smart City: A Review of the Literature on Smart Urban Governance' (2016) 82(2) *International Review of Administrative Sciences*, 392-408.

²⁶ See Rob Kitchin, 'The Real Time City? Big Data and Smart Urbanism' (2014) 79 *GeoJournal* 1-14; Taylor Shelton, Matthew Zook and Alan Wiig, 'The "Actually Existing Smart City"' (2015) 8, *Cambridge Journal of Regions, Economy and Society*, 13-25.

Tusikov, N. (2024) Greener Cities: Intellectual Property and Data in Sustainable Smart Cities. In Bitu Amani, Caroline Ncube, and Matthew Rimmer, eds. *The Elgar Companion to Intellectual Property and the Sustainable Development Goals*. Pp. 373-394. Cheltenham, UK: Edward Elgar.

Technology companies play an important role in marketing and popularizing the idea of making cities smart in order to offer their technologies as solutions to urban problems ranging from crumbling transit infrastructure and poor-air quality to civic disengagement.²⁷ IBM, in fact, trademarked the term ‘smarter cities’ in 2011.²⁸ Smart cities may be understood as aspirational, a ‘vision, manifesto or promise aiming to constitute the twenty-first century’s sustainable and ideal city form.’²⁹

Smart cities are incorporating technologies to reduce carbon emissions and energy use. In Parma, Italy, for example, the city transportation network has been modernized with new traffic-control cameras, smart-parking sensors, and vehicle-passage counting sensors, while in the Netherlands, the city of Amsterdam is endeavouring to reduce carbon emission by electric vehicles, smart energy grids, and smart meters.³⁰ Despite the perhaps-common perception that smart city technologies might decrease and better manage resource consumption, along with expanding renewable energy, there is considerable debate as to the relationship between smart cities and sustainability. For example, in a study that examined 43 smart city definitions from scholarly publications, there were significant variations in relationship between smart cities and sustainability as the definitions emphasized different elements of sustainability.³¹

Sustainability can be understood as having multiple dimensions. Environmental sustainability, for instance, relates to conservation of the natural environment and natural resources, while the social element includes equity, citizen well-being, and gratification of fundamental human needs, and the economic one consists of the economic vitality and diversity of urban areas.³² Further, definitions of sustainability might emphasize social or economic sustainability over environmental concerns, meaning that environmental sustainability should not be assumed to be the priority of what are termed smart sustainable cities.³³ As a result, cities termed ‘sustainable smart cities’ may not necessarily focus on environmental sustainability.

²⁷ See Jathan Sadowski and Roy Bendor, ‘Selling Smartness: Corporate Narratives and the Smart City as a Sociotechnical Imaginary’ (2019) 44(3) *Science, Technology, & Human Values*, 540-563.

²⁸ Ola Söderström, Till Paasche, and Francisco Klauser ‘Smart cities as corporate storytelling’ (2014) 18(3) *City: Analysis of Urban Change, Theory, Action*, 307-320. In Canada, IBM became the registered owner of the word mark (TMA835,005) in 2012, securing exclusive rights to use the mark or anything confusingly similar in association with any goods and services for which it is registered in Canada as per federal trademark legislation.

²⁹ Evelin Priscila Trindade, Marcus Phoebe Farias Hinnig, Eduardo Moreira da Costa, Jamile Sabatini Marques, Rogério Cid Bastos and Tan Yigitcanlar, ‘Sustainable development of smart cities: a systematic review of the literature’ (2017) 3(11) *Journal of Open Innovation: Technology, Market, and Complexity* 1-14 at 11.

³⁰ Laura Belli, Antonio Cilfone, Luca Davoli, Gianluigi Ferrari, Paolo Adorni, Francesco Di Nocera, Alessandro Dall’Olio, Cristina Pellegrini, Marco Mordacci, and Enzo Bertolotti ‘IoT-Enabled Smart Sustainable Cities: Challenges and Approaches’ (2020) 3 *Smart Cities*, 1039–1071 at 1048 and 1062.

³¹ Angeliki Maria Toli, Niamh Murtagh, and Hedley Smyth ‘Co-owned resources: IP and data in smart cities’ (2020) 32(2) *Journal of Service Theory and Practice*, 156-178.

³² Angeliki Maria Toli and Niamh Murtagh, ‘The Concept of Sustainability in Smart City Definitions’ (2020) 6(77) *Frontiers in Built Environment*, 1-10 at 2.

³³ Ibid.

Tusikov, N. (2024) Greener Cities: Intellectual Property and Data in Sustainable Smart Cities. In Bitu Amani, Caroline Ncube, and Matthew Rimmer, eds. *The Elgar Companion to Intellectual Property and the Sustainable Development Goals*. Pp. 373-394. Cheltenham, UK: Edward Elgar.

Given the multi-faceted nature of the concepts of ‘smart cities’ and ‘sustainability,’ it is important to establish whether smart city technologies deliver actual environmental benefits rather than assuming greater efficiency or decreased resource consumption;³⁴ ‘technology alone does not make smart energy systems ‘smart’.’³⁵ Similarly, merely capturing data does not ‘translate automatically into fairer communities, nor greener and more liveable cities.’³⁶ Equally, simply implementing real-time data collecting technologies within a city’s physical infrastructure does not automatically solve intractable social problems like crumbling transit infrastructure or leaking pipes. In fact, some smart city technologies may negatively affect climate change adaptation and mitigation efforts if cities employ non-sustainable technologies, such as those that are energy intensive.³⁷ Crucially, smart city climate-change measures must not distract from critical, large-scale mitigation efforts to decarbonize the energy system.³⁸

1.2 Governing Smart City Technologies

According to industry estimates, the global smart city market is expected to exceed US\$2.8 trillion by 2025.³⁹ The largest market share of this sector is held by companies in the United States, followed by western Europe, China and the Asia-Pacific.⁴⁰ Prominent companies in this sector include Cisco, Siemens, IBM, Hitachi, Microsoft, Schneider Electric, Huawei, and Intel. In a sector of this size, those who develop smart city technologies have a significant commercial interest in employing intellectual property law to safeguard their technologies. Those who control the smart city technology’s intellectual property – the algorithms powering the technology, its symbols, software, or design – control how that intellectual property is used by others. If the intellectual property proves fundamental, the economic payoffs can be significant.

Intellectual property is ‘a type of property regime whereby creators are granted a right, the nature of which is entirely dependent on the nature of the creation on the one hand, and the legal classification

³⁴ Similarly, criteria vary in what different actors classify as ‘cleantech’ and there also are associated assumptions related to the efficacy of technologies with, for example, carbon capture and storage technologies raising questions about their technical and political feasibility, see Wenting Cheng, ‘Intellectual Property and International Clean Technology Diffusion: Pathways and Prospects (2022) 12 *Asian Journal of International Law*, 370-402 at 399.

³⁵ Renee Obringer and Roshanak Nateghi, ‘What makes a city ‘smart’ in the Anthropocene? A critical review of smart cities under climate change’ (2021) 75 *Sustainable Cities and Society*, 1-12 at 5, citing the work D. Drysdale, B. Vad Mathiesen, H. Lund, ‘From Carbon Calculators to Energy System Analysis in Cities, (2019) 12(12) *Energies* 2307.

³⁶ Paolo Cardullo, ‘Smart Commons or a “Smart Approach” to the Commons?’ in Paolo Cardullo, Cesare Di Felicianantonio, Rob Kitchin (eds) *The Right to the Smart City*, Bingley (UK): Emerald Publishing Limited, 2019, 85-98, at 94.

³⁷ Renee Obringer and Roshanak Nateghi, ‘What makes a city ‘smart’ in the Anthropocene? A critical review of smart cities under climate change’ (2021) 75 *Sustainable Cities and Society*, 1-12.

³⁸ *Ibid.*, 5.

³⁹ Precedence Research, ‘Smart Cities Market Size to Surpass US\$7,162.5 BN by 2030,’ 10 May 2022, <https://www.globenewswire.com/en/news-release/2022/05/10/2439944/0/en/Smart-Cities-Market-Size-to-Surpass-US-7-162-5-BN-by-2030.html>.

⁴⁰ *Ibid.*

Tusikov, N. (2024) Greener Cities: Intellectual Property and Data in Sustainable Smart Cities. In Bitu Amani, Caroline Ncube, and Matthew Rimmer, eds. *The Elgar Companion to Intellectual Property and the Sustainable Development Goals*. Pp. 373-394. Cheltenham, UK: Edward Elgar.

of the creation on the other.⁴¹ IP laws are enacted via domestic laws the standards for which are embedded within regional and multilateral agreements, such as the multilateral 1994 Agreement on Trade-related Aspects of Intellectual Property Rights.⁴²

Smart city-related technologies can be protected not only through patents, but also trademarks, trade secrets, and copyright. Patents protect novel inventions relating to new, useful, and non-obvious processes like genetically modified drought-resistant crops.⁴³ Source code and scripts are covered under copyright law, and functionable aspects of software can be patentable, such as a new computer-configured method to process information, conferring exclusive rights to make, use, or sell an invention.

Copyright law determines how creative and artistic works like music, films, and books, along with software, can be accessed, reproduced, used, and shared.⁴⁴ The connection between smart city technologies and copyright law may not be immediately obvious, but copyright law protects the software programs operating the sensors and technologies operating within smart cities. In some jurisdictions, such as the European Union, the compilation of data can be protected by copyright, known as 'database rights.' Database rights can apply, for example, to lists of temperature changes.⁴⁵

Trademarks can consist of words, letters, numerals, drawings, symbols, colors, audible sounds, fragrances, three-dimensional shapes, logos, pictures, or a combination of these or other characteristics like Nike's swoosh or McDonald's golden arches.⁴⁶ Trademark law sets out the entities that can lawfully manufacture, distribute, advertise, and sell trademarked products, while consumers use trademarks to distinguish amongst similar offerings in the marketplace, such as a company with environmentally sustainable business practices. Trade secret law, meanwhile, protects competitive business information, often that which is the product of innovation. The value of this information is derived from its secrecy and will continue to be protected as long as the information remains secret, such as Google's proprietary search algorithms.

Statutory IP rights are limited in terms of duration, exceptions to protection, and the knowledge allowed to qualify for protection. Patents and copyright, for example, have specific periods of protection (with minimum terms prescribed by the *TRIPS Agreement for WTO members*) and after the expiry date,

⁴¹ Graham Dutfield and Uma Suthersanen *Global Intellectual Property Law* Cheltenham (UK): Edward Elgar Publishing, 2008, at 12.

⁴² *Agreement on Trade-related Aspects of Intellectual Property Rights* ('TRIPS Agreement'), opened for signature 15 December 1993, adopted 15 April 1994, entry into force 1 January 1995, *Marrakesh Agreement Establishing the World Trade Organization*, Annex 1C, 1869 UNTS 299 [hereinafter *TRIPS Agreement*].

⁴³ See, e.g., Luigi Palombi. *Gene Cartels: Biotech Patents in the Age of Free Trade*. Cheltenham (UK): Edward Elgar Publishing, 2009.

⁴⁴ See, e.g., Laura Jane Murry and Samuel E. Troschow. *Canadian Copyright: A Citizen's Guide*. Toronto (Canada): Between the Lines, 2013.

⁴⁵ Abbe EL Brown, 'Intellectual property and Climate Change,' in Rochelle Dreyfuss and Justine Pila (eds.), *The Oxford Handbook of Intellectual Property Law*, New York (US): Oxford University Press, 2017, 958-990, at 965.

⁴⁶ Sam Ricketson, *Intellectual Property: Cases, Materials and Commentary*, Sydney (Australia): Butterworths, 1994.

Tusikov, N. (2024) Greener Cities: Intellectual Property and Data in Sustainable Smart Cities. In Bitu Amani, Caroline Ncube, and Matthew Rimmer, eds. *The Elgar Companion to Intellectual Property and the Sustainable Development Goals*. Pp. 373-394. Cheltenham, UK: Edward Elgar.

the inventions and expressions covered, as the case may be, are considered freely available for all to use. Exceptions are also built into intellectual property law. In copyright, for example, fair use (also termed fair dealing in some jurisdictions) allows the use of copyrighted material for educational use, research, satire, criticism and news. Patent law allows for the compulsory licensing of pharmaceutical drugs during national emergencies. Trade secrets can be disclosed in matters involving public health or safety, the commission of a crime, government investigation, or, in certain jurisdictions, in relation to corporate whistleblowers.⁴⁷

To explain the role of intellectual property in smart cities and, more broadly, clean technologies, this chapter adopts a critical perspective on IP that underlines its economic and political importance. In the modern globalized economy, ownership of IP rights is central to economic dominance because economic benefits from intellectual property primarily flow to those who own these rights, which disproportionately tends to be large multinational rights holders in the United States and Europe.⁴⁸ IP functions as an instrument of control in that it provides those who control the IP with the power to determine who is allowed to use the knowledge protected by the IP rights in question. This right can involve denying or allowing use, or requiring payment as condition for the use of IP, such as through patent licensing fees.

IP laws are intended to provide monopoly rights, albeit limited in nature and duration as discussed above, to reward the creation of knowledge with the idea that such rights incentivize innovation. In practice, this is not always the case.⁴⁹ Patents, for instance, have ‘always required a delicate balance between monopoly and diffusion of knowledge and between protecting private profitability and social warfare, within and beyond the patent system.’⁵⁰

While the ostensible purpose of intellectual property laws is to reward creation and innovation, such laws may not incentivize innovation but present a barrier to countries’ economic development. Legal scholar Wenting Cheng notes that while the *TRIPS Agreement* and post-TRIPS trade agreements have ‘have directed the pendulum towards more extensive IP protection, a longer historical perspective suggests that late-comers of industrialization across the world had long benefited from policies supporting technology diffusion.’⁵¹ The United States is the leading proponent of ever-more-protectionist IP laws,⁵² but this was not always the case. Alongside other industrialized economies, the United States benefited economically from centuries of disregarding intellectual property laws,⁵³ including enacting policies to acquire ‘forbidden European know-how’ and recruit skilled immigrants to

⁴⁷ See Pamela Samuelson First Amendment defenses in trade secrecy cases. Rochelle C. Dreyfuss & Katherine J. Strandburg (eds), *The Law and Theory of Trade Secrecy: A Handbook of Contemporary Research*, Cheltenham (UK): Edward Elgar Press, 2011, 269-298.

⁴⁸ See particularly, Peter Drahos and John Braithwaite, *Information Feudalism: Who Owns the Knowledge Economy?* Oxford (UK): Oxford University Press, 2002; Debora Halbert, ‘Intellectual Property Piracy: The Narrative Construction of Deviance.’ (1997) 10 *International Journal for the Semiotics of Law*, 55–78; Susan K. Sell, *Private Power, Public Law: The Globalization of Intellectual Property Rights*, Cambridge (UK): Cambridge University Press, 2003.

⁴⁹ Dan Breznitz, *Innovation in Real Places: Strategies for Prosperity in an Unforgiving World*, New York (US): Oxford University Press, 2021.

⁵⁰ Wenting Cheng, ‘Intellectual Property and International Clean Technology Diffusion: Pathways and Prospects (2022) 12 *Asian Journal of International Law*, 370-402 at 374.

⁵¹ *Ibid.*, 374.

⁵² See Susan K. Sell, *Private Power, Public Law: The Globalization of Intellectual Property Rights*, Cambridge (UK), Cambridge University Press, 2003.

⁵³ See Peter Drahos and John Braithwaite, *Information Feudalism: Who Owns the Knowledge Economy?* Oxford (UK): Oxford University Press, 2002; Ha-Joon Chang, *Kicking Away The Ladder: Development Strategy In Historical Perspective: Policies and Institutions for Economic Development in Historical Perspective*. London (UK): Anthem Press, 2002.

Tusikov, N. (2024) Greener Cities: Intellectual Property and Data in Sustainable Smart Cities. In Bitu Amani, Caroline Ncube, and Matthew Rimmer, eds. *The Elgar Companion to Intellectual Property and the Sustainable Development Goals*. Pp. 373-394. Cheltenham, UK: Edward Elgar.

the United States who would bring with them the ‘professional training they had acquired in Europe’s factories.’⁵⁴

That these industrialized states promote historically strong global IP protections that now restrict the type of copying that has underwritten their development strongly suggests that IP is best thought of not as an instrument to encourage development, but as an instrument of control in which leading states ‘kick away the ladder’ so that developing states cannot follow the well-trod path of innovation through copying.⁵⁵

Economist Petra Moser’s historical research has demonstrated, for example, that patent laws do not necessarily incentivize innovation,⁵⁶ with economists Michele Boldrin and Daniel K. Levine arguing that the patent system actually represents a structural disincentive to innovation.⁵⁷ As economist Mariana Mazzucato and others have noted, the most economically risky research tends to be undertaken by governments, not private actors, and is not incentivized by the existence of IP.⁵⁸ From Google’s search algorithm, to Tesla and SpaceX, to GPS and the touchscreen integral to the first smartphones, all these innovations received funding to aid in their creation either directly from the US government or US government-funded granting organizations.⁵⁹ The companies then commercialized that research, a move that Mazzucato argues represents a privatization of the rewards from this earlier, foundational research.⁶⁰

2. GOVERNING DATA

Discussions of the intellectual property dimensions of smart city technologies are incomplete without a consideration of how the digital data collected and generated by sensors embedded within urban infrastructure is governed. Drawing from the critical data studies literature, this chapter defines data as a socially constructed form of knowledge, that is, people have made decisions about what information to collect, what technologies to use in the collection and analysis of the resulting data, and whether to share data freely or treat data as proprietary.⁶¹

Smart cities operate through the continual, real-time collection and analysis of data from people and the environment to fulfill the promise of more efficient, responsive city services like public transit,

⁵⁴ Wenting Cheng, ‘Intellectual Property and International Clean Technology Diffusion: Pathways and Prospects (2022) 12 *Asian Journal of International Law*, 370-402 at 374.

⁵⁵ Ha-Joon Chang, *Kicking Away The Ladder: Development Strategy In Historical Perspective: Policies and Institutions for Economic Development in Historical Perspective*, London (UK): Anthem Press, 2002.

⁵⁶ Petra Moser, ‘Patents and Innovation: Evidence from Economic History’ (2013) 27(1) *Journal of Economic Perspectives*, 23-44.

⁵⁷ Michele Boldrin and David K. Levine, *Against Intellectual Monopoly*, Cambridge, (UK): Cambridge University Press, 2007.

⁵⁸ Mariana Mazzucato, *The Value of Everything: Making and Taking in the Global Economy*, London (UK): Allen Lane, 2018.

⁵⁹ Ibid.

⁶⁰ Ibid.

⁶¹ See Lisa Gitelman (ed.) *Raw Data Is an Oxymoron*. Cambridge (MA): MIT Press, 2013; Rob Kitchin, ‘The Real Time City? Big Data and Smart Urbanism’ (2014) 79 *GeoJournal*, 1-14.

Tusikov, N. (2024) Greener Cities: Intellectual Property and Data in Sustainable Smart Cities. In Bitu Amani, Caroline Ncube, and Matthew Rimmer, eds. *The Elgar Companion to Intellectual Property and the Sustainable Development Goals*. Pp. 373-394. Cheltenham, UK: Edward Elgar.

energy, and waste collection, with sensors enabling ‘ubiquitous trackability’ of people and objects within the urban environment.⁶² Smart cities collect non-personal data that does not relate to identifiable persons, such as sensors that measure pollution and detect wastewater leaks. Technologies may also collect personal data, such as through facial-recognition software, automated license-plate readers, or services tied to individuals’ smart phones. Personal data, according to the European Union’s *General Data Protection Regulation*, is ‘a name, an identification number, location data, an online identifier or to one or more factors specific to the physical, physiological, genetic, mental, economic, cultural or social identity of that natural person’ (Article 4(1)).⁶³

Given the centrality of data to the functioning of smart cities, alongside appreciating intellectual property law, policymakers need to understand how data flowing from smart city technologies is managed and the distribution of economic benefits. Political scientists Blayne Haggart and Zachary Spicer argue data fundamentally changes the nature of digital infrastructure projects like smart cities in terms of ‘what they are designed to do, how they need to be managed, and their attendant benefits and challenges.’⁶⁴ Understanding how data governance occurs – rules governing how and what data will be collected, stored, use, and commodified – and the resulting effects are vitally important. Data governance is thus an expression of structural power, as theorized by international political economist Susan Strange,⁶⁵ which determines the rules of the game for economic and social activity.⁶⁶ Those who have the authority and capacity to govern data, whether public or private actors, can wield considerable power in determining how data is used, whether it is freely shared or monetized, and how economic and social benefits are distributed.

Proprietary control over data can allow for the exercise of network effects, in which the generation of data is used to refine existing products and processes.⁶⁷ A vendor that uses sensors to track traffic patterns throughout a city could amass knowledge about transit usage and congestion valuable to both businesses and government officials, which the vendor can then monetize into additional products. Companies may use intellectual property to extend their control over the data flowing from smart city technologies to exclude others. Airbnb, for example, has established a proprietary store of rental data that previously was publicly held by cities. Airbnb’s reluctance to share its datasets with cities, even invoking claims that its compilation of the dataset is protected under copyright law, means that city

⁶² Bert Jaap Koops, ‘On Legal Boundaries, Technologies, and Collapsing Dimensions of Privacy’, (2014) 3(2) *Politica e Società* 247-264 cited in Lilian Edwards, ‘Privacy, Security and Data Protection in Smart Cities: A Critical EU Law Perspective’ (2016) 2(31) *European Data Protection Law Review*, 28-58 at 39.

⁶³ *Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection*

of natural persons with regard to the processing of personal data and on the free movement of such data, and

repealing Directive 95/46/EC (General Data Protection Regulation), [2016] O.J., L. 119/1 [hereinafter *GDPR*].

⁶⁴ Blayne Haggart and Zachary Spicer, ‘Infrastructure, Smart Cities and the Knowledge Economy: Lessons for Policymakers from the Toronto Quayside Project’ (2022) *Canadian Public Administration*, 1-19, at 6.

⁶⁵ Susan Strange, *States and Markets*, 2nd ed, New York (US): Continuum, 1994.

⁶⁶ Blayne Haggart and Zachary Spicer, ‘Infrastructure, Smart Cities and the Knowledge Economy: Lessons for Policymakers from the Toronto Quayside Project’ (2022) *Canadian Public Administration*, 1-19, at 7.

⁶⁷ Nick Srnicek, *Platform Capitalism*, Cambridge (UK): Polity, 2017.

Tusikov, N. (2024) Greener Cities: Intellectual Property and Data in Sustainable Smart Cities. In Bitu Amani, Caroline Ncube, and Matthew Rimmer, eds. *The Elgar Companion to Intellectual Property and the Sustainable Development Goals*. Pp. 373-394. Cheltenham, UK: Edward Elgar.

authorities can face barriers in undertaking municipal planning and regulatory activities.⁶⁸

Policymakers also need to understand data governance rules, including requirements for data storage within nation-states (termed ‘data localization’) as countries may have differing data-protection standards. Data localization policies can be a way for cities or other actors to require legally that data produced or extracted from an area remain in and under the control of that jurisdiction, including complying with domestic privacy, data protection, or security rules.⁶⁹ Depending upon the technology vendors’ corporate structure and business strategy, companies may transfer smart city data to other jurisdictions. Companies, for example, may be required to share the personal data of one country’s residents with national security or law enforcement agencies of another country.⁷⁰ Data from smart city residents may end up being regulated by the laws of another country, laws that city residents had no role in defining, and without necessary transparency.

3. TORONTO’S SMART CITY EXPERIMENT

Sidewalk Labs’ proposal for a sustainable smart city in Toronto provides a useful case study to examine the central roles that intellectual property and data governance play in smart cities. Google’s Sidewalk Labs, created in 2015, won a bid in 2017 to propose a smart city neighbourhood for a 12-acre site termed Quayside on the eastern waterfront of downtown Toronto, even though Sidewalk Labs had little smart city experience at that point.⁷¹ Sidewalk Labs’ Director of Sustainability set out the company’s vision for environmental sustainability in a blog post: ‘With Quayside, we’ve set ourselves a goal I am the first to admit is absurdly difficult: we are proposing to plan, build and operate the first climate positive community in North America.’⁷² By climate positive, Sidewalk Labs meant ‘creating a neighbourhood that goes beyond zero and improves the health of the existing environment through its development.’⁷³

In its 1,500-page plan laying out its vision for the Toronto smart city project, Sidewalk Labs listed as its second priority, after job creation and economic development, to undertake ‘sustainable and climate-positive development.’⁷⁴ The company proposed to use energy-efficient building designs, including building a thermal grid that would employ geothermal (that is, underground) energy that

⁶⁸ Teresa Scassa, ‘Sharing Data in the Platform Economy: A Public Interest Argument for Access to Platform Data’ (2017) 50(4) *UBC Law Review*, 1017-1071.

⁶⁹ Tatevik Sargsyan, ‘Data Localization and the Role of Infrastructure for Surveillance, Privacy, and Security’ (2016) 10(0) *International Journal of Communication*, 2221–37.

⁷⁰ Heidi Bohaker, Lisa Austin, Andrew Clement and Stephanie Perrin, ‘Seeing Through the Cloud: National Jurisdiction and Location of Data, Servers, and Networks Still Matter in a Digitally Interconnected World’ (2015) *TSpace*, 1-57.

⁷¹ See Blayne Haggart, ‘The Selling of Toronto’s Smart City,’ in Mariana Valverde and Alexandra Flynn (eds.) *Smart Cities in Canada: Digital Dreams, Corporate Designs*, Toronto (Canada): Lorimer, 2020, 38-51.

⁷² Charlotte Matthews ‘Creating A Pathway To Climate Positive Communities’ *Medium*, 23 January 2019, <https://medium.com/sidewalk-toronto/creating-a-pathway-to-climate-positive-communities-32b67c85d528>.

⁷³ Ibid.

⁷⁴ Sidewalk Labs, *Toronto Tomorrow: Sidewalk Labs’ Master Innovation and Development Plan*, Vol. 1: ‘The Plans,’ 2019, at 174, <https://www.sidewalklabs.com/toronto>.

Tusikov, N. (2024) Greener Cities: Intellectual Property and Data in Sustainable Smart Cities. In Bitu Amani, Caroline Ncube, and Matthew Rimmer, eds. *The Elgar Companion to Intellectual Property and the Sustainable Development Goals*. Pp. 373-394. Cheltenham, UK: Edward Elgar.

would heat and cool air and water entering buildings instead of relying on natural gas.⁷⁵ It would build a power grid that would use solar energy, battery storage, and real-time energy pricing to reduce the impact of emissions from electricity use. Sidewalk Labs planned to make ‘our buildings more autonomous’ so that the company could ‘learn from how their occupants use them and, for example, turn down or up the temperature when a space is unoccupied.’⁷⁶ The idea here is that detailed, real-time consumption information will result in reduced energy use and lower carbon footprints.⁷⁷

3.1 Capturing intellectual property

For some project critics and the local technology industry, the key issue was who would control the intellectual property relating to the creation of smart city technologies.⁷⁸ Specifically, the concern was that Sidewalk Labs, not the Canadian technology industry, would disproportionately benefit from control over intellectual property.⁷⁹ This fear was realized when *The Globe and Mail* newspaper in Toronto obtained a confidential design-procurement document in which Sidewalk Labs set conditions for companies that would work in the Quayside project. In the document, Sidewalk Labs asked potential consultants to sign over intellectual property to Sidewalk Labs and ‘in cases where that’s not possible, to give Sidewalk an exclusive, royalty-free, worldwide licence to use it.’⁸⁰ In addition to these ambitious demands, Sidewalk Labs proposed to share with government only 10 percent of revenue from some technologies developed, tested or piloted in the project area for a 10-year period.⁸¹ In other words, in its initial plans Sidewalk Labs envisioned capturing the lion’s share of value from intellectual property rights stemming from technologies created for the project area.

An expert advisory panel set up to independently assess Sidewalk Labs’ plans concluded that the 10 percent revenue-sharing proposal of net profits was too little and the ten-year term was too short as

⁷⁵ Sidewalk Labs, *Toronto Tomorrow: Sidewalk Labs’ Master Innovation and Development Plan*, , Vol. 2: ‘The Urban Innovations,’ 2019, at 299, <https://www.sidewalklabs.com/toronto>.

⁷⁶ Charlotte Matthews ‘Creating A Pathway To Climate Positive Communities’ *Medium*, 23 January 2019, <https://medium.com/sidewalk-toronto/creating-a-pathway-to-climate-positive-communities-32b67c85d528>.

⁷⁷ Renee Obringer and Roshanak Nateghi, ‘What makes a city ‘smart’ in the Anthropocene? A critical review of smart cities under climate change’ (2021) *75 Sustainable Cities and Society* 1-12 at 5.

⁷⁸ See Jim Balsillie, ‘Sidewalk Toronto Has Only One Beneficiary, and It Is Not Toronto’ *Globe and Mail* (Toronto) 5 October 2018, <https://www.theglobeandmail.com/opinion/article-sidewalk-toronto-is-not-a-smart-city/>.

⁷⁹ Kurtis McBride, ‘Monetizing Smart Cities: Framing the Debate,’ *Centre for International Governance Innovation* (blog) 28 March 2018, <https://www.cigionline.org/articles/monetizing-smart-city-data/>.

⁸⁰ Josh O’Kane and Alex Bozikovic, ‘Sidewalk Labs taking steps to control intellectual property on Toronto’s ‘smart city’ document shows,’ *Globe and Mail* (Toronto) 31 August 2018, <https://www.theglobeandmail.com/business/article-sidewalk-labs-taking-steps-to-control-intellectual-property-on-toronto/>.

⁸¹ Sidewalk Labs, *Toronto Tomorrow: Sidewalk Labs’ Master Innovation and Development Plan*, Vol. 3: ‘The Partnership,’ 2019, at 126, <https://www.sidewalklabs.com/toronto>.

Tusikov, N. (2024) Greener Cities: Intellectual Property and Data in Sustainable Smart Cities. In Bitu Amani, Caroline Ncube, and Matthew Rimmer, eds. *The Elgar Companion to Intellectual Property and the Sustainable Development Goals*. Pp. 373-394. Cheltenham, UK: Edward Elgar.

‘city building takes time and innovations that involve city development play out over decades, not years.’⁸² Panelists also pointed out that Sidewalk Labs’ proposal only covered technology, leaving out any valuable insights the company might gain in executing its plans that could be exported to other smart cities.⁸³ For example, the company could capture economically valuable data about residents’ transit habits from monitoring traffic patterns and transit usage that it could transfer to other products.

Following this criticism, Sidewalk Labs amended its proposals to share more of the anticipated economic benefits. The new provisions included an ‘expanded patent pledge’ that would provide ‘Canadian innovators operating globally with the right to use all Sidewalk Labs’ Canadian and foreign patents covering hardware and software digital innovations.’⁸⁴ Sidewalk Labs also conceded on sharing benefits with Waterfront Toronto, the tripartite governmental body responsible for developing Toronto’s waterfront, with an ‘irrevocable, perpetual license to use the Site-Specific IP.’⁸⁵ Sidewalk Labs agreed to increase the revenue sharing from its original 10 percent, although at the time it did not specify either the amount or timeframe.⁸⁶ Myra Tawfik, a professor of IP commercialization and strategy at the University of Windsor in Ontario, Canada, stated that Sidewalk Labs’ new provisions reflected ‘much more a public-interest based model of intellectual-property generation and protection.’⁸⁷ Sidewalk Labs’ concession on patents would have meant that Canadian companies could build upon Sidewalk innovations without fear of infringement claims.

The extended public consultation on the Toronto project, a key requirement of the bidding process to which Sidewalk Labs agreed, usefully raised public and policymaker awareness of the important role of intellectual property in smart cities, an unusual aspect of this project as such discussions typically occur with city officials in private meetings. Important too was the public debate of the division of benefits between the technology vendor and the city as compensation in exchange for treating Toronto as a technology testbed.

3.2 Capturing data flows

Alongside debates about the appropriate division of economic benefits from intellectual property rights were broader worries about Sidewalk Labs’ data collection and use in the proposed smart city.⁸⁸ Civil-society groups and privacy activists criticized corporate surveillance and loss of privacy⁸⁹ and

⁸² Digital Strategy Advisory Panel, *Preliminary Commentary and Questions on Sidewalk Labs’ Draft Master Innovation and Development Plan (MIDP)*, Waterfront Toronto’s DSAP, September 10, 2019 at 1-41.

⁸³ *Ibid.*, 19.

⁸⁴ Waterfront Toronto, Plan Development Agreement Threshold Issues. Letter from George Zegarac President and CEO Waterfront Toronto to Josh Sirefman Sidewalk Labs LLC, 2019 at 8.

⁸⁵ *Ibid.*

⁸⁶ *Ibid.*

⁸⁷ Josh O’Kane, ‘New Sidewalk deal strikes better balance on IP and innovation but questions still unanswered, experts say’. *The Globe and Mail* (Toronto), 1 November 2019, <https://www.theglobeandmail.com/business/article-experts-and-others-weigh-in-on-new-sidewalk-deal/>

⁸⁸ See, Ellen P. Goodman and Julia Powles ‘Urbanism Under Google: Lessons from Sidewalk Toronto.’ *Fordham Law Review*. (2019) 88: 457-498.

⁸⁹ David Murakami Wood and Bianca Wylie ‘Is Sidewalk Labs doing enough to protect privacy? No.’ *Toronto Star* (Toronto), 28 August 2018, <https://www.thestar.com/opinion/contributors/thebigdebate/2018/08/28/is-sidewalk-labs-doing-enough-to-protect-privacy-no.html>.

Tusikov, N. (2024) Greener Cities: Intellectual Property and Data in Sustainable Smart Cities. In Bitu Amani, Caroline Ncube, and Matthew Rimmer, eds. *The Elgar Companion to Intellectual Property and the Sustainable Development Goals*. Pp. 373-394. Cheltenham, UK: Edward Elgar.

raised questions about how data would be governed and by whom.⁹⁰ Similar to the IP debate, critics feared that Sidewalk Labs, more specifically, Google, would primarily benefit from the capture of smart city data to the detriment of other partners, including local industry, government, and civil society.⁹¹

In its project plans, Sidewalk Labs proposed several ideas to govern how smart city-related data would be collected, used, and monetized in the Quayside project.⁹² Most relevant to this chapter was the plan to treat data collected from smart city technologies in public spaces as ‘public assets’ that should be made ‘publicly and freely available’ to those who wish to use the data.⁹³ From Sidewalk Labs’ perspective, this idea of public or ‘open data’ responded to public concerns about a dominant, especially corporate, actor controlling smart city data. In this perspective, any actor could use de-identified data (that is, data with personally identifiable information technically removed) for any commercial or non-commercial project.

Open data, that is, data that is freely available for anyone to use, is not a ‘panacea’ to problems of ownership of intellectual property and data in smart cities.⁹⁴ Adopting an open data policy, for instance, does not address questions of control.⁹⁵ Making data openly available does not mean that all actors can equally access, store, or process the data to deliver products and services. Large institutional actors, particularly tech companies with global operations, that have significant stores of proprietary data, algorithmic modeling capacity, and commercial distribution infrastructure have a market advantage.⁹⁶ Sidewalk Labs, in other words, would not have needed proprietary data access to monetize the Quayside project, as it could have capitalized upon Google’s dominant position in data collection and analytics.⁹⁷ Open data does not mean equity amongst corporate, government, and civil-society organizations.

Ultimately, how the revised IP and data plans might have played out and with what consequences remains a matter of speculation as Sidewalk Labs ended the Quayside project in May 2020. In a blog post announcing the project cancellation, now-retired CEO Daniel Doctoroff attributed the decision to the ‘unprecedented economic uncertainty’ caused by the Covid-19 pandemic.⁹⁸ Certainly, the pandemic was one factor, but another important reason was that the governmental body responsible

⁹⁰ Natasha Tusikov, ‘Privatized Policymaking in Toronto’s Proposed Smart City,’ In Mariana Valverde and Alexander Flynn, (eds), *Smart Cities in Canada: Digital Dreams, Corporate Designs*, Toronto (Canada): James Lorimer Ltd. Publishers, 2020, 68-82.

⁹¹ Ibid.

⁹² Ibid.

⁹³ Sidewalk Labs, ‘Master Innovation and Development Plan (MIDP): Volume 2, Chapter 5, Digital Innovation,’ Toronto, 2019, at 418, <https://www.sidewalklabs.com/toronto>

⁹⁴ Sean McDonald, ‘Toronto, Civic Data, and Trust,’ *Medium*, 17 October 2018, <https://medium.com/@McDapper/toronto-civic-data-and-trust-ec7ab928fb68>.

⁹⁵ Blayne Haggart and Zachary Spicer, ‘Infrastructure, Smart Cities and the Knowledge Economy: Lessons for Policymakers from the Toronto Quayside Project’ (2022) *Canadian Public Administration*, 1-19, at 8.

⁹⁶ Sean McDonald, ‘Toronto, Civic Data, and Trust,’ *Medium*, 17 October 2018, <https://medium.com/@McDapper/toronto-civic-data-and-trust-ec7ab928fb68>.

⁹⁷ Ibid.

⁹⁸ Daniel L. Doctoroff, ‘Why we’re no longer pursuing the Quayside project — and what’s next for Sidewalk Labs,’ *Medium*, 7 May 2020, <https://medium.com/sidewalk-talk/why-were-no-longer-pursuing-the-quayside-project-and-what-s-next-for-sidewalk-labs-9a61de3fee3a>

Tusikov, N. (2024) Greener Cities: Intellectual Property and Data in Sustainable Smart Cities. In Bitu Amani, Caroline Ncube, and Matthew Rimmer, eds. *The Elgar Companion to Intellectual Property and the Sustainable Development Goals*. Pp. 373-394. Cheltenham, UK: Edward Elgar.

for the smart city project, Waterfront Toronto, denied Sidewalk Labs' request to expand the project area from the original 12 acres (about five hectares) to its desired 190 acres (about 77 hectares).⁹⁹ Sidewalk Labs argued that the larger project area was essential to produce 'financially viable' technologies.¹⁰⁰

3.3 Market power

A critical assessment of the role of intellectual property and data governance in smart cities reveals how large corporate actors can wield market power. Those who own the intellectual property of key smart city technologies and those who can capture and monetize data flows from that technology are able to exert market power. Proprietary control over intellectual property and data enables those actors responsible to capture the disproportionate share of value from the technologies in question. Sidewalk Labs followed this familiar formula in its proposals for its smart city in Toronto.

Actors may deliberately use intellectual property rules to thwart potential competitors and maintain their economic dominance. Companies, for example, may create a 'patent thicket' by filing or purchasing bundles of patents to deter new entrants, or buying existing patents, not with the intention of producing something but of suing those who are already producing the good in question.¹⁰¹ Because the creation of new products, almost by definition, relies on existing monopolized knowledge, newcomers must either pay to license the patents, thus giving the incumbents a piece of their action, or face the risk of an economically ruinous lawsuit; in the clean-tech sector, for example, there have been patent disputes in relation to climate-ready crops and hybrid vehicles.¹⁰²

There is a distinctive global mapping to the distribution of intellectual property rights. Monopoly rents afforded by strong intellectual property protection have helped to create a hierarchical global economy in which economic benefits flow to a small number of IP-rich companies and workers, primarily located in the Global North, particularly the United States.¹⁰³ Rather than being enjoyed throughout the world, firms that control a disproportionate share of IP rights capture 'the lion's share of US and global profits.'¹⁰⁴

Related at least in part to the globally uneven distribution of economic benefits from intellectual property rights, there are 'huge inequities' in the worldwide development and spread of cleantech.¹⁰⁵

⁹⁹ Steve Diamond, 'Open Letter from Waterfront Toronto Board Chair, Stephen Diamond regarding Quayside,' Waterfront Toronto, 2019 <https://www.waterfronttoronto.ca/news/open-letter-waterfront-toronto-board-chair-stephen-diamond-regarding-quayside>.

¹⁰⁰ Daniel L. Doctoroff, 'Why we're no longer pursuing the Quayside project — and what's next for Sidewalk Labs,' *Medium*, 7 May 2020, <https://medium.com/sidewalk-talk/why-were-no-longer-pursuing-the-quayside-project-and-what-s-next-for-sidewalk-labs-9a61de3fee3a>.

¹⁰¹ See Herman Mark Schwartz, 'Global Secular Stagnation and the Rise of Intellectual Property Monopoly' (2021) 29(5) *Review of International Political Economy*, 1448-1476.

¹⁰² Matthew Rimmer, 'Climate-Ready Crops: Intellectual Property, Agriculture, and Climate Change' in Matthew Rimmer and Alison McLennan (eds) *Intellectual Property and Emerging Technologies: The New Biology*, Cheltenham and Northampton (UK): Edward Elgar, 2012, 320–60.

¹⁰³ Herman Mark Schwartz, 'Global Secular Stagnation and the Rise of Intellectual Property Monopoly' (2021) 29(5) *Review of International Political Economy*, 1448-1476.

¹⁰⁴ *Ibid.*, at 2. See also Ugo Pagano, 'The Crisis of Intellectual Monopoly Capitalism' (2014) 38(6) *Cambridge Journal of Economics*, 1409-29.

¹⁰⁵ Jocelyn Timperley, 'Green Tech Transfers Too Slow. COP26 Tech Transfer', (2021) 16(10) *Engineering and Technology*, 34-35, <https://digital-library.theiet.org/content/journals/10.1049/et.2021.1007>.

Tusikov, N. (2024) Greener Cities: Intellectual Property and Data in Sustainable Smart Cities. In Bitu Amani, Caroline Ncube, and Matthew Rimmer, eds. *The Elgar Companion to Intellectual Property and the Sustainable Development Goals*. Pp. 373-394. Cheltenham, UK: Edward Elgar.

Key countries in the EU, some Nordic countries, the US, Japan, and South Korea have dominated cleantech patents, with China increasing sharply in its filing of such patents.¹⁰⁶

It can be difficult for poor countries to acquire patented clean technologies. A patent analysis of the innovation cycle of cleantech for air pollution, for example, found a large technological gap between creator countries and countries that hoped to acquire the technologies.¹⁰⁷ Latecomers face a ‘green chasm’ in their ability to access patented technologies, as companies that dominate certain market sectors raise concerns of anti-competitive behaviour.¹⁰⁸ Another challenge to developing countries are trade barriers erected by industrialized countries like the United States that may have export control systems that restrict or prohibit the export of environmental technology to latecomer countries such as China.¹⁰⁹ In addition to demands for Global North states and firms to enable broader, easier distribution of clean technologies, there are calls for greater sharing of technologies within the Global South,¹¹⁰ with recognition that some clean technologies are not equally appropriate or valuable in both the Global North and the South.¹¹¹ Given the small internal markets of developing countries, they may have little choice other than cleantech designed for Global North countries, which may not suit local conditions or needs, especially when local manufacturers face IP barriers to designing and making cleantech locally.

3.4 Technological Lock-in

Cities are rich sources of data and by inserting themselves into the bureaucracy of city governance in operating key services, technology companies can set rules and standards over infrastructure that benefit their commercial interests. Companies prefer to treat the data they collect as proprietary assets from which they will extract value even when the data originates in the public realm, such as from transit systems. Power accrues to those actors that can exert control over and through the accumulation, interpretation, and commodification of both personal and non-personal data, like Google’s Waze app that offers real-time traffic updates and directions.¹¹² Large actors may be able to translate their capacity to amass, interpret, and control insights from data into monopolies over data, thereby capturing the dominant share of economic value produced by data. The societal risks from data monopolies, like other monopolies, include stifled innovation, higher prices, greater barriers to entry, and economic benefits disproportionately captured by the ‘data-opoly’ actors.

¹⁰⁶ Ibid.

¹⁰⁷ Sang-Jin Ahn and Ho Young Yoon ‘‘Green chasm’ in clean-tech for air pollution: Patent evidence of a long innovation cycle and a technological level gap’ (2020) 272 *Journal of Cleaner Production*, 1-15.

¹⁰⁸ Ibid., at 13.

¹⁰⁹ Ibid.

¹¹⁰ Abbe EL Brown, ‘Intellectual property and Climate Change,’ in Rochelle Dreyfuss and Justine Pila (eds.), *The Oxford Handbook of Intellectual Property Law*, New York (US): Oxford University Press, 2017, 958-990, at 976.

¹¹¹ Ibid.

¹¹² Blayne Haggart and Natasha Tusikov, *The New Knowledge: Information, Data and the Remaking of Global Power*. London (UK): Rowman and Littlefield, 2023.

Tusikov, N. (2024) Greener Cities: Intellectual Property and Data in Sustainable Smart Cities. In Bitá Amani, Caroline Ncube, and Matthew Rimmer, eds. *The Elgar Companion to Intellectual Property and the Sustainable Development Goals*. Pp. 373-394. Cheltenham, UK: Edward Elgar.

Proprietary claims over technologies and the flows of data related to those technologies raise a particular problem in relation to smart cities: that of “technological lock in,” which may occur when cities rely upon digital infrastructure.¹¹³ Imagine if a vendor providing a city’s smart energy grid suddenly hiked its fees or declined to make necessary repairs. Cities could be stranded if technology vendors interrupt or discontinue the provision of software that operates certain technologies, or if vendors are unable or unwilling to repair proprietary technologies. The phenomenon of ‘vendor lock-in’ occurs when companies supply capital- and knowledge-intensive technologies to cities, such as energy systems, that make switching vendors a costly, difficult affair.¹¹⁴

Municipal leaders may determine implementing or expanding digital infrastructure is not worth the risk of potential vendor lock-in, particularly if such infrastructure involves significant expense to integrate other systems.¹¹⁵ Integration of systems, typically termed interoperability, is particularly important when digital infrastructure is designed to operate on real-time data collection and work in cooperation with other systems to communicate and exchange information.¹¹⁶ Interoperability is made possible when systems adhere to established standards, translate between systems built with different standards, and establish agreements to share data.¹¹⁷ Sidewalk Labs, for instance, proposed a real-time data-based mobility management system to coordinate all traffic within the district, applying data analytics to employ real-time pricing on parking and curb usage, and set speed limits on speed-separated streets.¹¹⁸ Such a system would require interoperability amongst different systems tracking private, commercial and transit vehicles, as well as coordinating transit and parking systems.

Concerns over interoperability amongst the many types of smart city services offered by multiple vendors give rise to another kind of technological lock-in that smart cities may face, termed ‘city lock-in.’¹¹⁹ City lock-in refers to the challenges relating to transferring smart city services designed and implemented for one city to another city, thereby ‘reducing the benefits that come from economies of scale.’¹²⁰ Large smart city vendors, such as IBM or Cisco, often focus on large cities, meaning small- and medium-sized cities do not benefit from economies of scale.¹²¹ Systems designed for large cities may not translate effectively to other locations. Sidewalk Labs, for example, argued that an increase in

¹¹³ Rob Kitchin, ‘The Real Time City? Big Data and Smart Urbanism’ (2014) 79 *GeoJournal* 1-14, at 10.

¹¹⁴ Máté Szilárd Csukás and Roland Z. Szabó ‘Factors Hindering Smart City Developments in Medium-Sized Cities. ‘Club of Economics in Miskolc’ (2018) 14(1) *Theory, Methodology, Practice*, 3-14, at 9.

¹¹⁵ Pablo Sotres, Jorge Lanza, Luis Sánchez, Juan Ramón Santana, Carmen López, and Luis Muñoz, ‘Breaking Vendors and City Locks through a Semantic-enabled Global Interoperable Internet-of-Things System: A Smart Parking Case’ (2019) 19(229) *Sensors*, 1-21, at 1.

¹¹⁶ Ibid.

¹¹⁷ Ibid., at 12.

¹¹⁸ Sidewalk Labs, *Toronto Tomorrow: Sidewalk Labs’ Master Innovation and Development Plan*, Vol. 2, <https://www.sidewalklabs.com/toronto>.

¹¹⁹ Pablo Sotres, Jorge Lanza, Luis Sánchez, Juan Ramón Santana, Carmen López, and Luis Muñoz, ‘Breaking Vendors and City Locks through a Semantic-enabled Global Interoperable Internet-of-Things System: A Smart Parking Case’ (2019) 19(229) *Sensors*, 1-21.

¹²⁰ Ibid., at 2.

¹²¹ Máté Szilárd Csukás and Roland Z. Szabó ‘Factors Hindering Smart City Developments in Medium-Sized Cities. ‘Club of Economics in Miskolc’ (2018) 14(1) *Theory, Methodology, Practice*, 3-14, at 10.

Tusikov, N. (2024) Greener Cities: Intellectual Property and Data in Sustainable Smart Cities. In Bitá Amani, Caroline Ncube, and Matthew Rimmer, eds. *The Elgar Companion to Intellectual Property and the Sustainable Development Goals*. Pp. 373-394. Cheltenham, UK: Edward Elgar.

the project scale (from the original approximately five to 65 hectares) was necessary as technologies ‘do not become financially feasible at this smaller scale,’¹²² an expansion bid that Waterfront Toronto, denied.¹²³

Smaller cities can be ‘neglected’ if vendors see them as less profitable markets, a problem compounded at the governance level by a ‘shortage of local knowledge and capacities.’¹²⁴ Poor countries may be similarly neglected by cleantech companies, thereby making access to the vital clean technologies more difficult.

4. COUNTERING IP AND DATA BARRIERS

Given the barriers that intellectual property imposes on the global distribution of clean tech, it is important to consider possible avenues forward. Legal scholar Wenting Cheng argues that efforts to reform the treatment of intellectual property within bilateral or multilateral treaties would probably not be effective due to existing ‘power asymmetry in negotiations’ and a likely ‘prolonged negotiation process’ to deliberate amendments.¹²⁵ A more viable option, Cheng contends, is individual countries interpreting and implementing TRIPS flexibilities at the national level in line with international norms, a national approach that would place national patent offices in a direct role to institute TRIPS flexibilities.¹²⁶

Patent offices could also facilitate the creation of patent pools, in which multiple patent owners license patents to third parties. Patent pools can be used to ensure that innovation is developed in line with ‘common goals.’¹²⁷ Sidewalk Labs, for example, proposed a patent pledge for the Toronto project in which ‘Canadian innovators will have the right to use our Canadian and foreign patents covering hardware and software digital innovations and scale those businesses globally.’¹²⁸ Under this plan, any actor, commercial or non-commercial would be able ‘to build on Sidewalk Labs’ patents without fear of litigation or other assertion of patent infringement.’¹²⁹ A patent pool or patent pledge like that proposed by Sidewalk Labs could usefully stimulate the manufacture and distribution of much-needed cleantech.

¹²² Sidewalk Labs, 2019. Vol 1, 174.

¹²³ Steve Diamond, ‘Open Letter from Waterfront Toronto Board Chair, Stephen Diamond regarding Quayside,’ Waterfront Toronto, 2019 <https://www.waterfronttoronto.ca/news/open-letter-waterfront-toronto-board-chair-stephen-diamond-regarding-quayside>.

¹²⁴ Máté Szilárd Csukás and Roland Z. Szabó ‘Factors Hindering Smart City Developments in Medium-Sized Cities. ‘Club of Economics in Miskolc’ (2018) 14(1) *Theory, Methodology, Practice*, 3-14, at 10.

¹²⁵ Wenting Cheng, ‘Intellectual Property and International Clean Technology Diffusion: Pathways and Prospects (2022) 12 *Asian Journal of International Law*, 370-402 at 401.

¹²⁶ Ibid.

¹²⁷ Mariana Mazzucato, *The Value of Everything: Making and Taking in the Global Economy*, London (UK): Allen Lane, 2018, Chapter 7.

¹²⁸ Nicole LeBlanc, ‘6 ways our Quayside proposal supports the Canadian tech community,’ *Medium*, 20 November 2019, <https://medium.com/sidewalk-toronto/6-ways-our-quayside-proposal-supports-the-canadian-tech-community-74300ce289c4>.

¹²⁹ Ibid.

Tusikov, N. (2024) Greener Cities: Intellectual Property and Data in Sustainable Smart Cities. In Bitu Amani, Caroline Ncube, and Matthew Rimmer, eds. *The Elgar Companion to Intellectual Property and the Sustainable Development Goals*. Pp. 373-394. Cheltenham, UK: Edward Elgar.

Cities can also be sites of experimentation with intellectual property.¹³⁰ European policymakers in the Policy for Department Economic and Scientific Policy, for instance, recommended that public authorities and companies ‘explore the creation and use of specific new intellectual property ownership rights or contract forms.’¹³¹ These new ownership rights could extend to local governments and citizens, alongside including commercial entities, thereby broadening the distribution of economic benefits from smart city technologies.¹³²

While the piecemeal amendments described above to intellectual property may deliver in some beneficial results, any comprehensive plan to counter climate change, argues legal scholar Matthew Rimmer, must address problems inherent to the IP regime.¹³³ Intellectual property, for example, provides incentives for both cleantech and fossil fuel technologies; reforming the patent system will be ineffective as it ‘subsidises research and development in respect of dirty, polluting technologies.’¹³⁴ The current IP regime, especially as practiced by the US government and US multinationals with monopoly pricing and barriers to market entry, is strangling the critical global distribution of renewable technologies and this approach is at odds with the survival of world capitalism and of the planet itself.¹³⁵ Calling for a systematic approach to facilitating a certain type of innovation like cleantech, economist Mariana Mazzucato contends that the ‘assumption is that policy should be about “levelling the playing field,”’ but achieving ‘innovation of a particular type (e.g., green innovation) will require not levelling but tilting the playing field.’¹³⁶

One way to tilt the field is compulsory licensing where governments permit the production of patented products without the patent owners’ consent, typically reserved for specific purposes such as the manufacture of critical medicines or vaccines to deal with pandemics like HIV/AIDS. The Covid-19 pandemic, specifically the global inequality of vaccine distribution, has generated widespread popular interest in discussions of IP waivers for poor countries to access the vaccine.¹³⁷ IP waivers could be employed to permit the broader manufacture and use of clean technologies. Indeed, a waiver for a Covid vaccine ‘could set a precedent for similar arrangement in the diffusion of clean technologies.’¹³⁸

Potential areas of reform relating to data from smart city technologies could be cooperative ventures that share data through open data policies. Terms such as the ‘data commons’ understand data

¹³⁰ On the topic of Chinese cities and experimentation with innovation solutions to shift away from fossil fuels, see Peter Drahos, *Survival Governance: Energy and Climate in the Chinese Century*, New York (US): Oxford University Press, 2021, Chapter 8.

¹³¹ European Parliament, *Mapping Smart Cities in the EU*. Directorate-General for Internal Policies. Policy Department Economic and Scientific Policy, 2014, at 105.

¹³² Ibid.

¹³³ Matthew Rimmer, *Intellectual Property and Climate Change*, Cheltenham (UK): Edward Elgar, 2011, at 378.

¹³⁴ Ibid.

¹³⁵ Peter Drahos, *Survival Governance: Energy and Climate in the Chinese Century*, New York (US): Oxford University Press, 2021, 223.

¹³⁶ Mariana Mazzucato, *The Value of Everything: Making and Taking in the Global Economy*, London (UK): Allen Lane, 2018, Chapter 7.

¹³⁷ Michelle McMurry-Heath, ‘Mariana Mazzucato, Jayati Ghosh and Els Torrele on waiving covid patents,’ *The Economist*, 20 April 2021, <https://www.economist.com/by-invitation/2021/04/20/mariana-mazzucato-jayati-ghosh-and-els-torrele-on-waiving-covid-patents>.

¹³⁸ Wenting Cheng, ‘Intellectual Property and International Clean Technology Diffusion: Pathways and Prospects (2022) 12 *Asian Journal of International Law*, 370-402 at 401.

Tusikov, N. (2024) Greener Cities: Intellectual Property and Data in Sustainable Smart Cities. In Bitá Amani, Caroline Ncube, and Matthew Rimmer, eds. *The Elgar Companion to Intellectual Property and the Sustainable Development Goals*. Pp. 373-394. Cheltenham, UK: Edward Elgar.

as collectively managed resources, which for smart cities point to the need for benefits to be publicly shared.¹³⁹ In smart city circles, Barcelona has become famous for its citizen-led approach to data and digital infrastructure and innovation. Barcelona embedded its smart city technologies within a citizen-focused framework of technological sovereignty, based not only in personal autonomy, but also with collective oversight and decision-making about how the data would be used.¹⁴⁰ Under this plan, city residents, not just technology vendors, have the authority to decide how cities should work.

Open data practices do not necessarily result in cities that are fairer or more environmentally sustainable as they reflect the broader legal, socio-economic, and technological practices within which cities are situated.¹⁴¹ Sharing data, moreover, requires resources to maintain data platforms for sharing, as well as ensuring data quality, provenance, and timeliness.¹⁴² While some projects may have open data requirements, few aim to provide open intellectual property practices as industrial actors are, for example, often unwilling to ‘share IP or even communicate with potential competitors.’¹⁴³

Addressing the governance problems raised in this chapter relating to smart city technologies requires subject-matter expertise and regulatory authority to implement and enforce rules, such as those regarding the use of data, and access to and distribution of proprietary technologies. Local officials, however, may not ‘have the legal powers, resources, or know-how to implement the respective solutions’ even though cities have the responsibility to implement the UN’s SDG 11 of making cities inclusive, safe, resilient, and sustainable.¹⁴⁴ Further, city officials may not have the authority or resources to implement policies relating to the shift to renewable energies. The United Nations recognizes this regulatory and policy capacity gap at the city level, reporting that for many governments governing digital technologies ‘is a completely new area, and as such, digital policy and governance capacity need to be significantly strengthened or built from scratch.’¹⁴⁵

A key challenge with developing and maintaining smart city technologies is cultivating digital expertise among public-sector employees, a challenge that extends beyond clean technologies. Studies of smart cities, for example, have found cities were poorly equipped to evaluate the technologies that vendors were selling as municipal IT staff lacked the capacity to assess the technologies under

¹³⁹ Michiel De Lange, ‘The Right to the Datafied City: Interfacing the Urban Data Commons,’ in Paolo Cardullo, Cesare Di Felicianantonio, Rob Kitchin (eds), *The Right to the Smart City*, Emerald Publishing Limited, 2019, 71-83.

¹⁴⁰ Monique Mann, Peta Mitchell, Marcus Foth, and Irina Anastasiu, ‘#BlockSidewalk to Barcelona: Technological Sovereignty and the Social License to Operate Smart Cities’ 2020 71(9) *Journal of the Association for Information Science and Technology*, 1103–15.

¹⁴¹ Paolo Cardullo, ‘Smart Commons or a “Smart Approach” to the Commons?’ in Paolo Cardullo, Cesare Di Felicianantonio, Rob Kitchin (eds) *The Right to the Smart City*, Bingley (UK): Emerald Publishing Limited, 2019, 85-98.

¹⁴² Angeliki Maria Toli, Niamh Murtagh, and Hedley Smyth ‘Co-owned resources: IP and data in smart cities’ (2020) 32(2) *Journal of Service Theory and Practice*, 156-178, at 167.

¹⁴³ *Ibid.*, at 166.

¹⁴⁴ Anna Visvizi and Raquel Pérez del Hoyo, ‘Sustainable development goals (SDGs) in the smart city: A tool or an approach? (An introduction).’ In Anna Visvizi and Raquel Pérez del Hoyo, (eds.) *Smart Cities and the UN SDGs*, Cambridge (MA, USA): Elsevier, 2021, 1-11, at 3.

¹⁴⁵ United Nations, *World Cities Report 2020: The Value of Sustainable Urbanization*, UN Habitat, Key Findings and Messages, 2020 <https://unhabitat.org/World%20Cities%20Report%202020>, at 203.

Tusikov, N. (2024) Greener Cities: Intellectual Property and Data in Sustainable Smart Cities. In Bitu Amani, Caroline Ncube, and Matthew Rimmer, eds. *The Elgar Companion to Intellectual Property and the Sustainable Development Goals*. Pp. 373-394. Cheltenham, UK: Edward Elgar.

consideration or, problematically, were contracted from the same vendor company vying to provide the services.¹⁴⁶ While the former example speaks to gaps in necessary skills, the latter situation raises the additional problem of a conflict of interest as the same company may be involved in evaluating the technology that the city has contracted it to supply.

Building and maintaining a smart city requires greater governance capabilities than effective procurement and maintenance. It also ‘requires a political understanding of technology’ with ‘a focus on both economic gains and other public values,’ concluded a meta-study of 51 academic publications on smart-city governance.¹⁴⁷ Depending upon the procurement process and intellectual property rights applied to the digital infrastructure, for example, it may be difficult to determine who is responsible for maintaining the infrastructure and what happens in the case of the vendor’s bankruptcy, sale, or shift in business model away from smart cities.

To address knowledge gaps, city officials need to build expertise on intellectual property and the use and governance of data. Central to this capacity-building, however, is ‘independent policy-relevant research,’ as without independent knowledge sources, gaps ‘will be filled by profit-driven consulting firms, technology vendors and affiliated researchers, and well-intentioned but overstretched civil society groups.’¹⁴⁸ Such actors, however well meaning, may rationally promote their own products and perspectives at the expense of the broader public good, and they may also endeavour to shape state regulatory efforts to protect their commercial interests.

CONCLUSION

This chapter examines how smart cities might deliver on the UN’s Sustainable Development Goal 11 of environmentally sustainable cities. It argues that smart cities, including those focused on environmental sustainability, typically rely upon proprietary technologies and operate through the real-time collection and analysis of data flows emanating from the smart city technologies. As IP and data are central to the creation, operation, and governance of smart cities, public officials who plan and run smart cities require a critical understanding not only of IP, but also of how data from smart city technologies should be collected, used, and governed. Through its analysis of the Google affiliate Sidewalk Labs’ plans for a ‘climate positive’ smart city in Toronto, the chapter demonstrates how technology vendors commercialize IP related to smart city technologies and monetize data flows.

Without a critical appreciation of IP and data governance, for example, city officials might get ‘locked in’ to certain vendors or systems that make switching suppliers difficult and costly, or that pose

¹⁴⁶ Jenni Viitanen and Richard Kingston, ‘Smart cities and green growth: outsourcing democratic and environmental resilience to the global technology sector,’ (2014) 46 *Environment and Planning A*, 803-819.

¹⁴⁷ Albert Meijer and Manuel Pedro Rodríguez Bolívar, ‘Governing the Smart City: A Review of the Literature on Smart Urban Governance’ (2016) 82(2) *International Review of Administrative Sciences*, 392–408, at 392.

¹⁴⁸ Blayne Haggart and Zachary Spicer, ‘Infrastructure, Smart Cities and the Knowledge Economy: Lessons for Policymakers from the Toronto Quayside Project’ (2022) *Canadian Public Administration*, 1-19, at 15.

Tusikov, N. (2024) Greener Cities: Intellectual Property and Data in Sustainable Smart Cities. In Bitá Amani, Caroline Ncube, and Matthew Rimmer, eds. *The Elgar Companion to Intellectual Property and the Sustainable Development Goals*. Pp. 373-394. Cheltenham, UK: Edward Elgar.

barriers to effective interoperability.¹⁴⁹ Expertise in intellectual property and data governance should become a critical skillset for city officials, alongside knowledge of procurement, budgeting, and other issues central to running cities.

Sidewalk Labs' (initial) proposals to control the IP and data relating to smart city technologies created in the Toronto project usefully highlight the win/lose narrative that battles over intellectual property often evoke. In Toronto's case, the fear amongst local residents and the tech industry was that a US multinational company would reap the economic benefits, and also siphon smart city data to the United States. Similar, win/lose scenarios are evident in many discussions of the global distribution of cleantech, which is necessary to deal with the climate crisis but often impeded by IP, primarily controlled by companies in the Global North. As legal scholar Wenting Cheng argues, cleantech prompts a 'rethinking of the North-South winner-loser framing' that so often dominates debates of clean technology diffusion and, more broadly, of intellectual property rights in general.¹⁵⁰ Re-evaluating the use – and misuse – of intellectual property rights in the case of cleantech will occur when 'developed countries recognize the "all losers" outcome in the case of ecological collapse.'¹⁵¹

¹⁴⁹ See Máté Szilárd Csukás and Roland Z. Szabó 'Factors Hindering Smart City Developments in Medium-Sized Cities. 'Club of Economics in Miskolc' (2018) 14(1) *Theory, Methodology, Practice*, 3-14, and Pablo Sotres, Jorge Lanza, Luis Sánchez, Juan Ramón Santana, Carmen López, and Luis Muñoz, 'Breaking Vendors and City Locks through a Semantic-enabled Global Interoperable Internet-of-Things System: A Smart Parking Case' (2019) 19(229) *Sensors*, 1-21.

¹⁵⁰ Wenting Cheng, 'Intellectual Property and International Clean Technology Diffusion: Pathways and Prospects (2022) 12 *Asian Journal of International Law*, 370-402 at 402.

¹⁵¹ Ibid.