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# Smart City Policies Revisited: Considerations for a Truly Smart and Sustainable Urbanism Practice

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## Abstract

The notion of smart cities, presently, is a highly popular topic in urban policy circles. This concept is adopted by many cities across the world—with an aim of increasing urban smartness in various ways and areas. Productivity, innovation, liveability, wellbeing, accessibility, sustainability, governance, planning, and citizen participation are among these areas. Despite good policy intentions, smart city initiatives in practice had only limited impact in delivering the desired urban outcomes. This paper aims to investigate the smart city phenomenon and its planning practice approaches from an evolutionary perspective. The study places smart city plans and strategies of a number of cities across the globe under the microscope. The findings reveal that current smart city efforts are not adequate to combat the challenges of the Anthropocene epoch—that is already upon us. This paper concludes with a consolidated definition of smart and sustainable cities and considerations for moving towards Post-Anthropocentric urbanism—that is truly smart and sustainable urbanism—to avoid an imminent urban ecocide.

## Keywords

Anthropocene; Smart city; Sustainable city; Sustainable urban development; Smart and sustainable urbanism; Post-Anthropocentric urbanism; More-than-human city; Urban policy; Urban ecocide; Climate change

## 1. INTRODUCTION: THE ANTHROPOCENE EPOCH

At the turn of the 21st century, geologists proposed a new geological epoch that is characterised by human activities and impacts on the geology of our planet—so-called ‘Anthropo-

cene’ (Lewis and Maslin, 2015; Yigitcanlar and Dizdaroglu, 2015). In recent years, this proposal has gained acceptance and made Anthropocene the subsequent epoch to Holocene—Holocene allowed human survival and civilisation advancement by establishing ideal climate conditions without much drastic temperature variations (Figure 1). There is a common agreement on the beginning date of Anthropocene being the early part of the Industrial Revolution (Steffen et al., 2015). It dates back to the invention of steam engine in the late-1700s—specifically, to the James Watt steam engine, developed between 1763 and 1775, which was an improvement on the design of the 1712 Thomas Newcomen steam engine (Yun et al., 2018). Industrial revolution marked an important moment in the human history not only for advanced technology development and urbanisation, but also for eventual local and global-scale environmental impacts (Arbolino et al., 2018a, 2018c; Derick-


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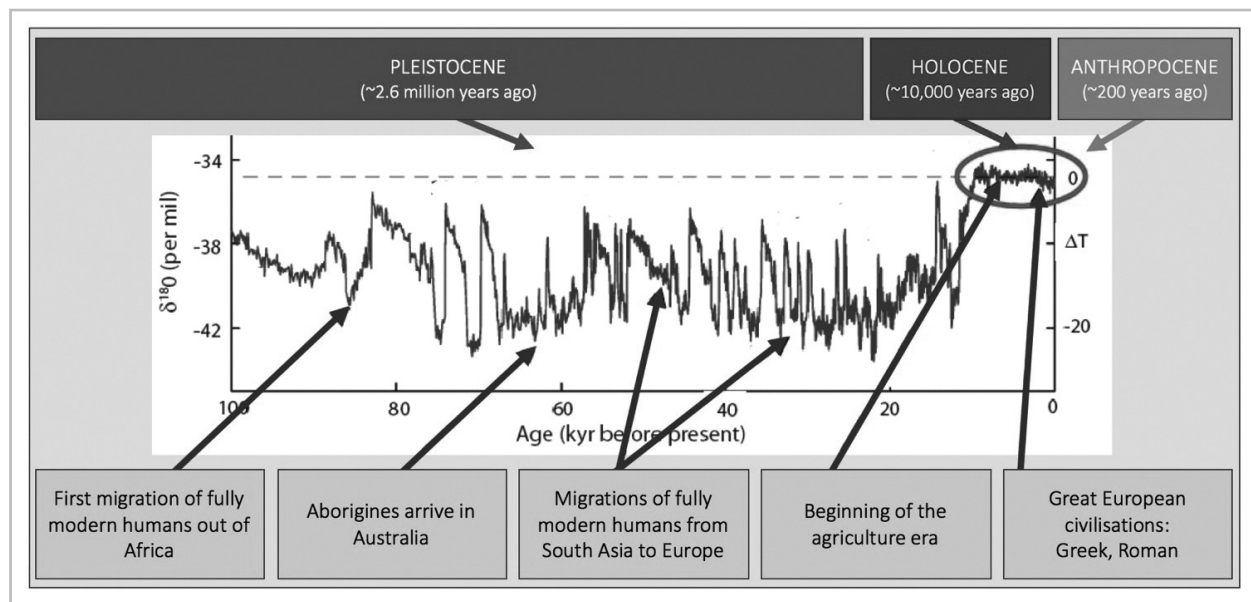


Fig. 1. Geological epochs and temperature changes during the human existence on Earth

Source: derived from Rockström et al. (2009)

son, 2018). At the Anthropocene, urban growth is taking place on an unprecedented scale globally and its externalities on the environment and society are evident (Mahbub et al., 2011; Dizdaroglu and Yigitcanlar, 2014; Arbolino et al., 2018b).

Today, all corners of the world are confronted with various environmental and/or socioeconomic crises (Kamruzzaman et al., 2015; Arbolino et al., 2017). For instance, increasing number and intensity of extreme weather events, natural disasters, climate change, sea-level rise, biodiversity loss, ecosystem destruction, increasingly transforming biosphere, regional disparities, socioeconomic inequity and knowledge and digital divides are only some of them (Carrillo et al., 2014; Goonetilleke et al., 2014; Fox et al., 2017). Besides, an increasing megacity development rate around the world is creating governance and management quagmires for urban administrations—so far, there are more than 45 cities of the world with over 10 million population (Teriman et al., 2009; Yigitcanlar and Teriman, 2015). These crises are mainly originated from rapid population growth and a net total growth of consumption of natural resources, combined with vigorous industrialisation, urbanisation, mobilisation, globalisation, agricultural intensification and excessive consumption-driven lifestyles (Yigitcanlar et al., 2015; Kamruzzaman et al., 2018). Furthermore, the findings of climate studies have been giving warnings on the domino-effect of climate events could soon move

the planet into a tipping point or a ‘hothouse’ state—which human efforts to reduce emissions will be increasingly futile (Rockström et al., 2009; Steffen et al., 2011).

While many scholars blame the Anthropocene—more correctly excessive human activities and impacts on the planet—for the abovementioned externalities, some also see it as an opportunity to somehow ease or perhaps even reverse these externalities. For instance, Haff (2014) views technology as an outcome of the Anthropocene and sets of basic dynamical rules that apply to human interactions with the technological world of the Anthropocene—i.e., inaccessibility, impotence, control, reciprocity, performance, provision. However, he foresees the possibility of addressing the planetary problems caused by humans, in the case, appropriate technology is applied after carefully considering these rules. Additionally, Grumbach and Hamant (2018) perceive the Anthropocene as an age of rapid transformations in all areas ranging from climate to society and argue that the opportunities created in this era could potentially pose a solution. On that very point, Grumbach and Hamant (2018, p.87) state that, “strikingly, the rise of the [digital technologies] occurred in the 1970s [was also] a time when the ecological movements took momentum”. Furthermore, Barnosky et al. (2014) underline the importance of translating science for policymakers to help navigate the Anthropocene, where in this process technology

could be an aid.

During the last decade the concept of 'smart cities' raised as a popular topic in urban policy circles—aiming to increase urban smartness in various ways to combat the unprecedented environmental risks and social challenges confronted in the 21st century (Yigitcanlar, 2015; Lara et al., 2016; Trindade et al., 2017). However, the current smart city practices are claimed being an Anthropocene urbanism practice by a number of scholars (Foth, 2017; Derickson, 2018). Smart city practices, thus, only have limited capabilities for generating substantial remedies to the present-day ill urbanisation practices (Yigitcanlar et al., 2018b; 2018c). Against this backdrop, the paper aims to investigate the smart city phenomenon and its planning practice approaches from an evolutionary perspective. In order to do so, the study reported in this paper places smart city strategies and planning approaches of a number of the cities (n=15) across the globe under the microscope. In the light of the literature and results of the conducted smart city practice analysis, the paper puts forward some considerations for moving away from the current Anthropocentric urbanism paradigm and practice.

## 2. EVOLUTION OF THE SMART CITY NOTION AND PRACTICE

The smart city notion has devised from two different origins of school of thoughts—viewing cities and urban development from different lenses.

The first origin has a strong sustainability focus—an environmental view on urban development. Under this school of thought, the notion was a spin off concept originated from the 'smart growth' movement in the 1990s, and conceptualised cities as sustainable cities—also as eco-cities (Dizdaroglu et al., 2012; Perveen et al., 2017a, 2017b). This movement basically advocates planning strategies, including sustainable urban development, land use and transport integration, use of appropriate technology, to address sprawl development and associated environmental externalities (Yigitcanlar, 2009; Dur et al., 2014; Dur and Yigitcanlar, 2015; Yigitcanlar and Kamruzzaman, 2015).

The second one has a strong knowledge and innovation economy focus—a technocentric view of the city development. Under this school of thought, in the 1990s, the notion concentrated on the essential diversifications in the capacity

of societies to generate technical innovations that are suitable to their needs (Yigitcanlar and Dur, 2013; Komninos, 2016). In other words, in this perspective, the smart city concept is seen as an influencer the ways in which local governments create and shape opportunities for innovation and also for technology development and vast adoption (Komninos et al., 2018).

While both school of thoughts, mainly led by scholarly research, had their separate ways and methods to generate smartness in cities, the real worldwide popularity of smart cities concept—would not be wrong to say the 'smart city craze' or 'smart city bandwagon'—was created with the heavily engagement and lead of the private sector. The popularity of smart city concept has particularly rapidly increased following the speech of Samuel J. Palmisano, then the IBM Chairman, President and CEO, on the topic of 'A Smarter Planet: The Next Leadership Agenda' in 2008 (Söderström et al., 2014). Consequently, as argued by Yigitcanlar et al. (2018a, p. 146), the smart cities concept has evolved to mean "almost any form of technology-based innovation in the planning, development, operation and management of cities, for example, the deployment of smart mobility solutions to combat urban traffic challenges... With the offerings of digital technologies and online urban planning opportunities, this concept increased its popularity [particularly] among the urban technocrats."

The smart city notion is highly complex and dynamic in nature and hence throughout the last decades it has evolved, and at the various stages of the evolution it is conceptualised differently (Figure 2). The evolution of smart and sustainable cities is briefly discussed in the following sections, and diagrammatically illustrated in Figure 2 for an easy comprehension.

### 2.1. Sustainable Cities

Even though the smart city concept was popularised by the technology companies around the mid-2000s, its origin dates back first to the 'sustainable urban development' notion of the 1970s, and then the 'smart growth' notion of the 1990s (Dizdaroglu and Yigitcanlar, 2016; Ioppolo et al., 2018; Perveen et al., 2018). The interpretation of urban smartness under the smart growth movements is well aligned with the environmental view of sustainable urban development. There are three most common development approaches that are directly associated with sustainable urban development. These are: (a) New urbanism; (2) Eco-city or sustainable city; (c) Smart growth (Yigitcanlar and Kamruzzaman, 2014). Up until the recent smart city movement, smart growth and new urban-

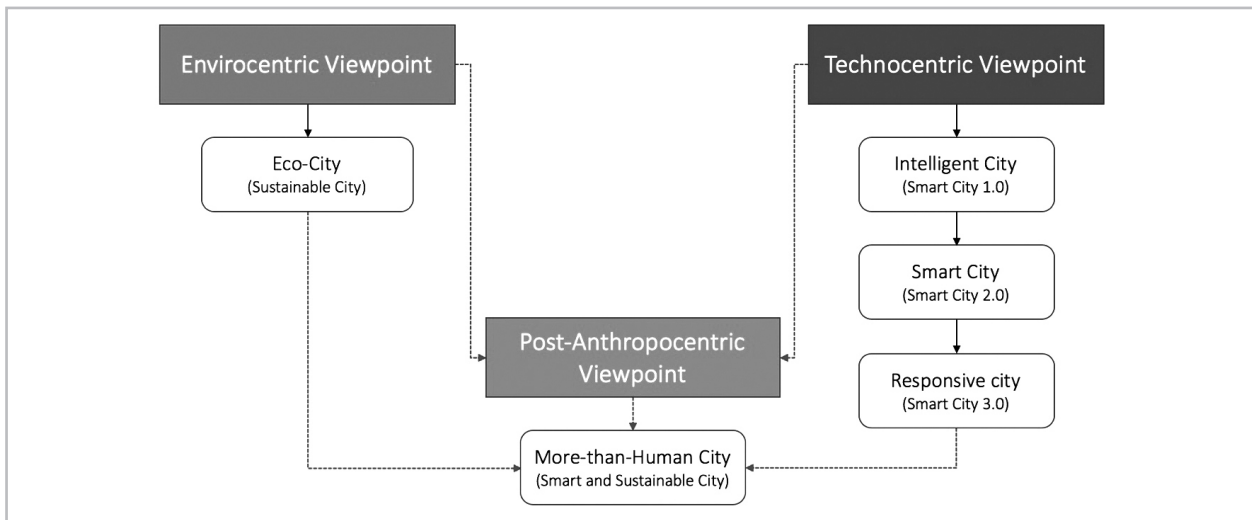


Fig. 2. Evolution of smart and sustainable cities

Source: author

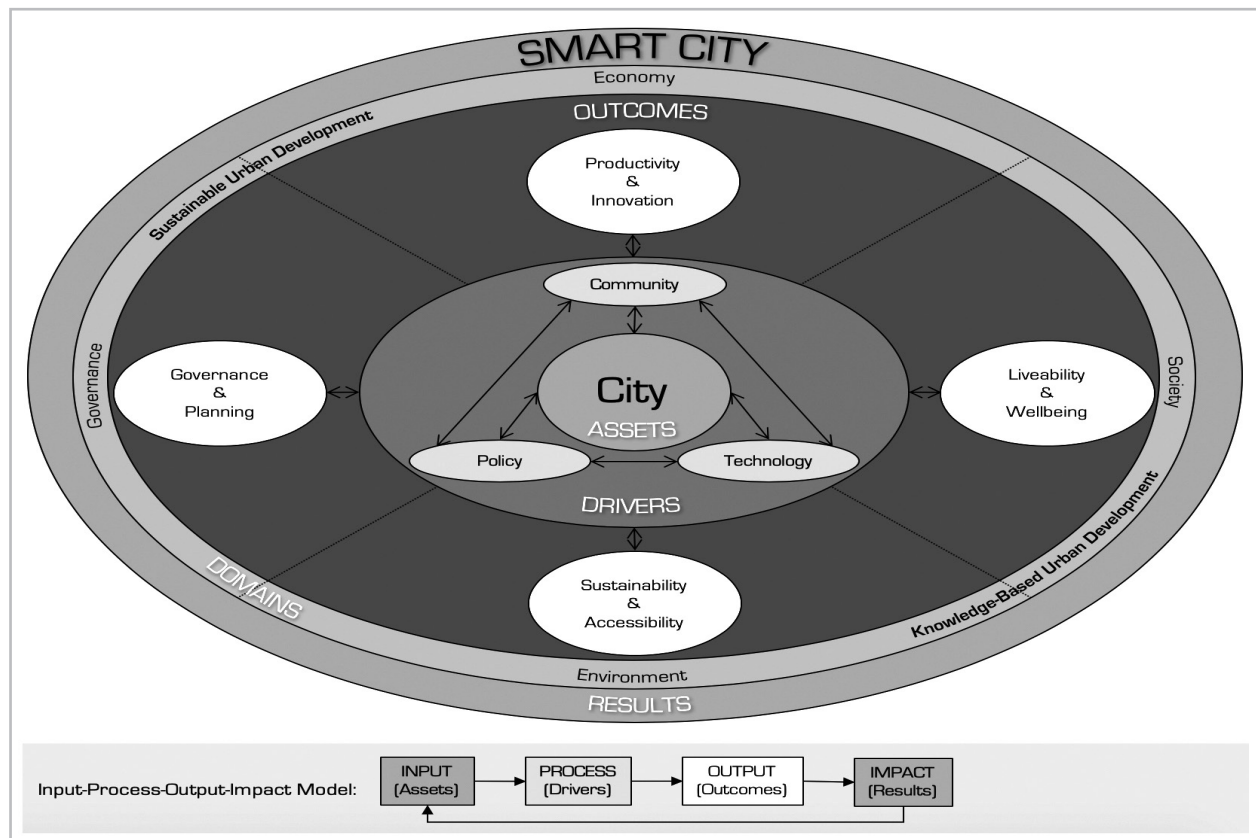


Fig. 3. Multidimensional sustainable smart city framework

Source: derived from Yigitcanlar et al. (2018d)

ism were relatively mainstreamed, particularly in the North American context. This was mainly due to the integration of these two approaches into the planning strategies of some of the North American cities. Again, until the recent smart city movement, the eco-city or sustainable city model has also been influential in many parts of the world, particularly in Europe, Oceania, and South East Asia (Jepson and Edwards, 2010).

Despite, sustainable cities are smarter in various aspects (mainly ecological) than those branded as smart cities, so far, sustainable cities have not been considered widely under the flagship of smart cities. However, there are some recent conceptualisation attempts in the literature to brand cities as 'sustainable smart cities' or 'smart and sustainable cities' (Moreno et al., 2014; Yigitcanlar et al., 2018a; Zawieska and Pieriegud, 2018). Figure 3 illustrates one of those sustainable smart city conceptual frameworks—for further information on this framework see Yigitcanlar et al. (2018a).

## 2.2. Intelligent Cities

The school of thought that perceives smart cities from the lens of knowledge and innovation economy—with heavy technocentrism—sees its origins dating back to the 'intelligent city' notion of the 1990s (Batty, 1990). The intelligent cities paradigm brought together the trajectories of the knowledge and innovation economy, and the spread of internet and world-wide-web as major technological innovations (Komninos, 2011). Intelligent cities were the realm of technology companies providing innovative technologies to local governments in order to improve and optimise the efficiency of specific city functions (Lee et al., 2008). Intelligent cities are considered as the 'first-generation smart city', and their conceptualisation was heavily expert-focused, and almost no opportunity was given for citizens to participate in the policy- and decision-making processes.

## 2.3. Smart Cities

In the late-2000s, as an extension of the intelligent city movement, the 'smart cities' concept emphasised a greater degree of involvement of local authorities in deploying smart technologies (Yigitcanlar and Lee, 2014). Targeting city infrastructure and services, these technologies established a new digital data layer to drive efficiencies through smart meters and shared mobility. This 'second-generation smart city' approach employs technology products—e.g., sensors and other Internet-of-Things (IoT) devices with a growing emphasis on

urban informatics, urban science and data analytics—aiming to solve acute urban problems (Lim and Taeihagh, 2018). Yet, the highly top-down approach in investment and governance remains—leaving only limited room for the community's voice in the policymaking process.

The rapidly rising popularity of the smart city concept also resulted in numerous smart cities ranking and indexing exercises—such as smart city indices prepared by Forbes, IESE, Easy Park Group, and many others. In recent years, large number of reports on smart cities also were prepared by consulting companies including comprehensive reviews of smart cities and urban technologies—such as IBM, KPMG, McKinsey, PwC, and many others. There is also a significant increase in scholarly research on smart cities during the last several years—see the bibliometric study of Mora et al. (2017) on smart city research. Along with the ranking exercises, consulting firms' reports, and scholarly work, a number of cities have also started to develop smart city policies and strategies to pave their way to desired urban outcomes—strategy documents of the renowned 15 smart cities across the globe are investigated in the next section of this paper.

## 2.4. Responsive Cities

In recent years, as a reaction to the conceptualisation and practice limitations of smart cities, a new type of city model is envisaged. That is a city that provides citizens with active engagement in and usage of smart solutions to improve living standards and urban sustainability. This is referred to as 'responsive cities' (Goldsmith and Crawford, 2014). These cities restore the citizen's right to the digital city by giving citizens power to use smart technology to contribute to planning, design and management of their cities (Foth et al., 2015). The responsive city, or the 'third-generation smart city', relies on technology—e.g., sensors, IoT and mobile devices communicating autonomously—with the aim of improving urban life for residents, employees and visitors. Technology-enabled public participatory decision-making practices is a common characteristic of this type of cities.

## 3. PLANNING STRATEGIES OF SMART CITIES

In spite of the relatively short history of smart cities, at present there are many cities across the globe are adopting this brand and calling themselves as smart. In other words, smart



cities are a global phenomenon today, and there are well over 250 smart city projects underway across 178 cities around the world—for example, India alone hosts 100 of those projects (Praharaj et al., 2018). The planning objectives and the type of smart city projects that cities implement in these cities are highly diverse—many targeting sustainable outcomes for the city and citizens (Yigitcanlar, 2016).

The recent research outputs, however, have indicated that those cities that are claiming to be smart might not be necessarily smart, especially when it gets to sustainability issues. For instance, a recent study on 15 UK smart cities found no evidence that urban smartness contributes to sustainable outcomes (Yigitcanlar and Kamruzzaman, 2018a). Another research on Australian cities revealed the smartness of cities does not lead to sustainable commuting patterns (Yigitcanlar and Kamruzzaman, 2018b). Additionally, studies on smart cities in Africa and South Korea—including Songdo recognised as the world's 'smartest' city—evidenced the environmental downfalls of these ambitious projects (Watson, 2014; Yigitcanlar and Lee, 2014). Furthermore, it is argued that cities cannot be truly smart unless they produce zero waste (Zaman and Lehmann, 2013), and make a net positive contribution to the ecosystem (Birkeland, 2012).

Keeping this limitation in mind, the paper placed the official smart city policy documents of the recognised cities around the world—that are or claimed themselves as a 'smart city' or a 'smart city to be' in the near future—under the microscope. The selection criteria for determining the cities and their strategy documents were: (a) The city having globally recognised as a smart city or an emerging smart city; (b) The strategy or policy report having a specific focus on smart cities and developed for a particular city—rather than a part of the city, region or nation; (c) The report being available online and full-text; (d) The report being a full report—rather than an executive summary or highlights; (e) The report being in English language only—due to language limitations of the author beyond English; (f) The report having listed specific vision, objectives, policies or strategies on the smart city transformation of the city; (g) The report being available for download from an official website of the city—rather than commercial websites, posing possible authenticity issues, and costs involved for purchase; (h) The search was conducted in September 2018—only including policies published and made available online before this date.

After a thorough web search, in total 15 case smart cities were determined fulfilling the mentioned selection criteria.

Adoption of these inclusion criteria resulted in exclusion of a number of smart cities particularly from the Southeast Asia—e.g., Korean and Japanese smart cities. The selected 15 case cities were: Birmingham, Greenwich and London from the UK; Brussels from Belgium; Edmonton, Ottawa and Toronto from Canada; Brisbane, Newcastle, Parramatta and Sunshine Coast from Australia; Wellington from New Zealand; Singapore from Singapore; Stockholm from Sweden; Vienna from Austria. The policy documents were downloaded from the official city government websites and their vision or aims, smartness domains and smart city strategies or policies were obtained and reviewed. Table 1 lists this information.

In terms of country context, Australia, with four cities, was the country with highest number of qualified cities with published smart strategy policy reports. It is followed by the UK and Canada, with three cities each. Other countries were Austria, Belgium, New Zealand, Singapore and Sweden, with one city each. In terms of regional context, Europe, with four countries, was dominating the smart city policy area. This is followed by Oceania, with two countries. Other regions were North America and South East Asia with one country each. However, this is not to say, outside of these nations there are no smart city strategies. For example, some of the Brazilian, Finnish, Japanese, and Korean cities have already developed smart city strategies, however, they are not included in the review, as they do not comply with the abovementioned selection criteria.

The analysis of the smart city strategies of the abovementioned 15 cities has shown that there is an increasing recognition of the innovation-technology, economic competitiveness, governance, and sustainability perspectives to offer higher quality of living to the residents and becoming magnet for global investment and talent. All of the main items of the multidimensional sustainable smart city framework—presented in Figure 3—seem to be covered by various strategy element of these cities. However, none of them fully and comprehensively addressed all of the desired urban outcomes of the framework—i.e., productivity, innovation, liveability, wellbeing, accessibility, sustainability, governance, planning. Most of the 15 official smart city strategies documents are brief in nature. Some of them are brief in terms of smart city focus as they were the early examples—such as Wellington Towards 2040: Smart Capital that was released in 2011. From 2014 onwards, official strategy documents started to be released with a stronger concentration on the smart city notion—the first one of those being Vienna's Smart City Wien Framework Strategy.

Table 1. Salient characteristics of smart city strategy policy documents, in alphabetical order

City and country	Smart city policy title	Release year	Vision, aim or main objective	Smartness domain	Specific smart city strategy or policy
Birmingham, UK	Roadmap to a Smarter Birmingham	2014	Creating a framework to demonstrate leadership and facilitate cooperation with citywide partners in the development of our city	<ul style="list-style-type: none"> <li>Technology and place</li> <li>People</li> <li>Economy</li> </ul>	<ul style="list-style-type: none"> <li>Attractive residential and commercial properties with future proof digital connectivity</li> <li>Intelligent, personalised and better targeted public services</li> <li>Economic value created by businesses and service providers through better use of data/information</li> <li>A highly capable workforce attractive to employers, with skilled individuals able to gain employment easily</li> <li>A move towards a low carbon economy through energy and fuel savings, and improved air quality</li> <li>Joined up health and care services which help individuals and make the health system more sustainable</li> </ul>
Brisbane, Australia	Smart, Connected Brisbane	2017	Setting out a range of actions to deliver Brisbane's New World City agenda and preserve and enhance the city's liveability and prosperity into the future	<ul style="list-style-type: none"> <li>Efficient</li> <li>Personalised</li> <li>Inclusive</li> <li>Prosperous</li> <li>Insightful</li> <li>Transparent</li> </ul>	<ul style="list-style-type: none"> <li>Digital technologies are employed to make activities efficient and effective</li> <li>People have a personalised human, experience within the city</li> <li>Everyone has the chance to get involved, be empowered and participate in city life</li> <li>Smart, connected thinking leads to prosperity and economic opportunities</li> <li>Analytics creates insight that enables data-driven decision making</li> <li>Open shared data and collaboration creates an environment of trust and innovation within the city</li> </ul>
Brussels, Belgium	Brussels Smart City Strategy	2017	Meeting the challenges of urban development with the help of technologies by stimulating innovation and the involvement of public services, citizens, businesses and the academic world	<ul style="list-style-type: none"> <li>Sustainable development</li> <li>Human development</li> <li>Economic development</li> </ul>	<ul style="list-style-type: none"> <li>Connectivity (sensors, regional Wi-Fi network, broadband network via the IRIS net optical fibre)</li> <li>Human capital (digital and computer literacy skills)</li> <li>Use of the internet by children and population groups negatively affected by the digital divide</li> <li>Integration of digital technology to make the flow of data more effective in the public services, opening up the data (open data) and analysis of the data (big data)</li> <li>Digital public services</li> <li>Cross-functionality through a governance model that ensures the participation and collaboration of the different members of the Brussels Government and authorities</li> <li>Pooling and reuse, both at the level of infrastructure like the regional video-protection platform and of data.</li> <li>Digital inclusion</li> <li>The European dimension through the integration of Brussels initiatives in the existing networks at the European Union level and the reuse of their standards</li> </ul>
Edmonton, Canada	Smart City Strategy	2017	Creating a unified experience for citizens to benefit from efficient and effective city services through a citizen centric smart city strategy	<ul style="list-style-type: none"> <li>Resiliency</li> <li>Liveability</li> <li>Workability</li> </ul>	<ul style="list-style-type: none"> <li>A municipality that is resilient is adaptive, well-planned and flexible one that can withstand external shocks such as economic crises, epidemics, congestions, transport breakdowns, and environmental pollutions</li> <li>A municipality that is liveable is one in which citizens are healthy, engaged with their community and actively minimize their environmental footprint</li> <li>A municipality that is workable is one that connects its citizens through advanced transportation and mobility, broadband connectivity, educational institutions and smart infrastructure</li> </ul>
Greenwich, UK	Greenwich Smart City Strategy	2015	Delivering resource-efficient, low-carbon, healthy and liveable neighbourhoods, where citizens enjoy improved social and economic opportunities	<ul style="list-style-type: none"> <li>Inclusive</li> <li>Citizen centric</li> <li>Transparent</li> <li>Standards and good practice</li> </ul>	<ul style="list-style-type: none"> <li>Transforming neighbourhoods and communities</li> <li>Transforming infrastructure</li> <li>Transforming public services</li> <li>Transforming the Greenwich economy</li> </ul>
London, UK	Smarter London Together	2018	Making London the smartest city in the world	<ul style="list-style-type: none"> <li>Transport</li> <li>Environment</li> <li>Health</li> <li>Housing</li> <li>Culture</li> <li>Economic development</li> </ul>	<ul style="list-style-type: none"> <li>More user-designed services</li> <li>Strike a new deal for city data</li> <li>World-class connectivity and smarter streets</li> <li>Enhance digital leadership and skills</li> <li>Improve city-wide collaboration</li> </ul>
Newcastle, Australia	Draft Smart City Strategy 2017-2021	2017	Making Newcastle an open, collaborative, and connected city that uses technology to make things easier, more liveable and sustainable for all people	<ul style="list-style-type: none"> <li>Smart mobility</li> <li>Smart governance</li> <li>Smart living</li> <li>Smart environment</li> <li>Smart people</li> <li>Smart economy</li> </ul>	<ul style="list-style-type: none"> <li>Improve operational efficiency</li> <li>Achieve higher levels of sustainability</li> <li>Better service local community needs</li> <li>Stimulate economic development activity</li> <li>Increase community inclusion and participation</li> <li>Position Newcastle as a smart city internationally</li> </ul>
Ottawa, Canada	Smart City 2.0	2017	Implement and deliver a smart city strategy that is driven by the city's smart city eco-system	<ul style="list-style-type: none"> <li>Connected city</li> <li>Smart economy</li> <li>Innovative government</li> </ul>	<ul style="list-style-type: none"> <li>Create a city where all residents and businesses are connected in an efficient, affordable, and ubiquitous way</li> <li>Stimulate economic growth by supporting knowledge-based business expansion and attraction, local entrepreneurs, and smart talent development</li> <li>Develop new and innovative ways to impact the lives of residents and businesses through the creative use of new service delivery models, technology solutions, and partnerships</li> </ul>

(Table 1 continued)

City and country	Smart city policy title	Release year	Vision, aim or main objective	Smartness domain	Specific smart city strategy or policy
Parramatta, Australia	Smart City Masterplan	2015	Leveraging the foundations of good urban planning, transparent governance, open data and enabling technologies that underpin city's position as a vibrant, people-centric, connected and economically prosperous city	<ul style="list-style-type: none"> <li>• Open data</li> <li>• System connectivity</li> <li>• Open standards</li> <li>• Information governance</li> <li>• Data management</li> <li>• Data analytics</li> <li>• Smart buildings and places</li> <li>• Sensors and control</li> <li>• Holistic approach</li> <li>• Trans-sector collaboration</li> </ul>	<ul style="list-style-type: none"> <li>• Utilising open data as an essential foundation</li> <li>• Setting a global standard for communities</li> <li>• Operationalising a smart city intelligence centre as a collaborative approach to city intelligence</li> <li>• Using community learning centres for skilling, learning and development</li> <li>• Using crowd funding to help let the community identify their needs</li> <li>• Engaging with local communities for smart city solutions</li> <li>• Making mobile services as a key capability</li> <li>• Connecting with the world through community Wi-Fi</li> <li>• Navigating through the city with digital wayfinding</li> <li>• Making commuting easy</li> <li>• Reducing carbon emissions with electric vehicles and convenient charging stations</li> <li>• Using digital art to support creative digital connections</li> </ul>
Singapore, Singapore	Shaping a Smart Nation	2014	Aspiring to be the world's first Smart Nation, leading the world in the use of data and analytics to improve peoples' lives	<ul style="list-style-type: none"> <li>• Hard and soft infrastructure</li> <li>• Nationwide sensor network</li> <li>• Progressive governance</li> <li>• Seamless experience for businesses and individuals</li> </ul>	<ul style="list-style-type: none"> <li>• Moving from an intelligent nation to a smart nation</li> <li>• Building Singapore-based tech and local tech talent</li> <li>• Fostering resilience and strong governance</li> <li>• Delivering an enhanced experience for citizens</li> </ul>
Stockholm, Sweden	Smart and Connected	2017	Becoming the smartest city in the world with a society where growth, innovation, low environmental impact, equality and accessibility are a given	<ul style="list-style-type: none"> <li>• Financially sustainable</li> <li>• Ecologically sustainable</li> <li>• Democratically sustainable</li> <li>• Socially sustainable</li> </ul>	<ul style="list-style-type: none"> <li>• Become attractive, innovative and growing, with the perspective of making an investment or establishing a business</li> <li>• Become a central node in a global network of successful cities</li> <li>• Become one of the best start-up scenes in the world</li> <li>• Develop and grow through entrepreneurship and intrapreneurship in digitalization and new technologies</li> <li>• Attract talent and visitors, international and national</li> <li>• Cost efficiently manage public operations by making full use of digitalization and new technologies</li> <li>• Have a wide-range of businesses, with a favourable environment for an inclusive labour market</li> <li>• Use digitalization and new technologies to make it easier for residents and businesses to be environmentally friendly</li> <li>• Become well prepared to deal with the possible effects of climate change such as heavy rainfall and rising sea levels</li> <li>• Reduce energy consumption and carbon footprint</li> <li>• Provide sustainable solutions for modern transport</li> <li>• Use digitalization and new technologies to stimulate biological diversity and conservation</li> <li>• Produce goods and services in a resource efficient way with minimal environmental impact</li> <li>• Simplify and enhance residents' influence and participation in the democratic process through digitalization</li> <li>• Become open and accessible to everyone—residents, visitors and businesses</li> <li>• Have transparent administrations and operations, where digitalization and new technologies are deployed to make the democratic processes and decisions</li> <li>• Achieve digital inclusion, where digitalization and new technologies are deployed to bridge social divides, create a community, and work together to reduce exclusion</li> <li>• Help city dwellers to communicate, work, study, experience, and have an active life, based on each person's unique circumstances</li> <li>• Increase perceived safety, in private and public spaces, and create vibrant and safe neighbourhoods</li> </ul>
Sunshine Coast, Australia	Smart City Framework	2015	Balancing improvements to quality of life, economic growth and environmental sustainability through the implementation of key technologies associated with the development and attraction of businesses, the management and monitoring of pollution as well as key improvements to the transport, health and education sectors	<ul style="list-style-type: none"> <li>• Liveable</li> <li>• Workable</li> <li>• Sustainable</li> </ul>	<ul style="list-style-type: none"> <li>• Reducing carbon emissions, and energy consumption by 25% and 50% respectively</li> <li>• Revolutionizing the government's relationship to people</li> <li>• Enabling real-time alerts and monitoring to create citywide situational awareness</li> <li>• Reducing costs through platform development and infrastructure sharing</li> <li>• Reducing crime by 20%</li> <li>• Enabling better financial forecasting</li> <li>• Simulating and visualizing designs to enable more precise planning</li> <li>• Creating world-class infrastructure</li> <li>• Extracting the maximum value from city assets</li> <li>• Reducing traffic jams by 20%</li> <li>• Attracting new business investment</li> <li>• Supporting skills development</li> <li>• Unleashing innovation</li> <li>• Creating a "recruiting tool" for attracting talent and jobs</li> <li>• Reducing resource use through optimization</li> <li>• Increasing economies of scale</li> </ul>



(Table 1 continued)

City and country	Smart city policy title	Release year	Vision, aim or main objective	Smartness domain	Specific smart city strategy or policy
Toronto, Canada	Framework for a Smarter Toronto	2017	Becoming an attractive and safe city that evokes pride, passion and a sense of belonging where people of all ages and abilities can enjoy a good quality of life	<ul style="list-style-type: none"> <li>• Collaborate</li> <li>• Catalyse</li> <li>• Connect</li> <li>• Co-create</li> <li>• Communicate</li> </ul>	<ul style="list-style-type: none"> <li>• Lead and set the course for change in collaboration with influencers from the private, academic and non-profit sectors</li> <li>• Ensure key internal players leverage and align the city's smart initiatives</li> <li>• Utilise a working group as a forum for a smarter Toronto, expanding its reach to include regional collaboration</li> <li>• Build upon the city's open data initiative and its open data masterplan</li> <li>• Formalise the city's approach to developing big data analytics capabilities across all divisions, in partnership with the private sector and academia</li> <li>• Develop and nurture a talent sub-strategy to deploy data-skilled resources across the city, collaborating with universities and colleges to create a resource pipeline</li> <li>• Foster digital inclusion by providing access to broadband and training, tools and knowledge needed to make the most of it</li> <li>• Build upon the city's technology procurement workshops and engagement with the information and communications technology industry</li> <li>• Pursue smart funding opportunities to develop project scope and proposal</li> <li>• Evaluate the Return-on-Investment of smart city investments, ensuring the benefits they accrue are reinvested into solutions addressing social and cultural challenges</li> <li>• Leverage the opportunity to engage with the World Council on City Data to support smart city policy implementation, measure impact and secure global recognition</li> <li>• Enhance partnerships with industry, universities and incubators; rally Toronto's innovation ecosystem around the co-creation of urban solutions</li> <li>• Liaise with the city's Civic Innovation Office, strengthening the link between city divisions and outside innovators to create solutions to public facing challenges</li> <li>• Showcase smart municipal technologies and practices at future smart forums &amp; summits</li> <li>• Develop an inventory of ambassadors from Toronto's smart ecosystem</li> <li>• Create a communications vehicle to externally highlight Toronto's smart capabilities and support the development of solutions to city challenges</li> <li>• Engage public and private sector stakeholders from Toronto and other Canadian cities via summits and forums, positioning Toronto as the catalyst for change</li> <li>• Produce an international engagement strategy with peer smart cities</li> </ul>
Vienna, Austria	Smart City Wien Framework Strategy	2014	Offering optimum quality of living, combined with highest possible resource preservation, for all citizens, which can be achieved through comprehensive innovations	Quality of living Resources Innovation	<ul style="list-style-type: none"> <li>• Vienna to maintain its quality of living at the current superlative level and continue to focus on social inclusion in its policy design: as a result, Vienna to become the city with the highest quality of living and life satisfaction in Europe by 2050</li> <li>• Per-capita greenhouse gas emissions in Vienna to drop at least 35% by 2030 and by 80% by 2050—compared to 1990</li> <li>• Vienna to become an innovation leader due to top-end research, a strong economy and education by 2050</li> </ul>
Wellington, New Zealand	Wellington Towards 2040: Smart Capital	2011	Becoming a smart capital by building on the strengths of highly skilled and innovative population, strong eco-city performance, position as New Zealand's capital connected culturally and socially to the world and compact city form	People centred Connected Ecologically sound Dynamic	<ul style="list-style-type: none"> <li>• The visibility of Maori culture and history in the city</li> <li>• An open and welcoming city</li> <li>• Suburbs with unique identities</li> <li>• Wellington as a smart city</li> <li>• Active communities that support innovation and resilience</li> <li>• Healthy and safe communities</li> <li>• Effective and efficient regional, national and international infrastructure</li> <li>• National and international connections that support Wellington's socioeconomic goals</li> <li>• City and regional connections that drive economic growth and innovation</li> <li>• People connected internationally to support market access and knowledge exchange</li> <li>• A city-based approach to developing Wellington as an eco-city</li> <li>• Infrastructure to create a secure and resilient city</li> <li>• A sustainable urban environment</li> <li>• A city with a green economy</li> <li>• Supporting the central city as the economic engine of the wider city and region</li> <li>• Wellington's story told through built form and natural heritage</li> <li>• A showcase for Wellington's green infrastructure and quality-built form</li> <li>• Actively plan for population growth in the central city</li> <li>• Strategic planning for urban development in the central city</li> </ul>

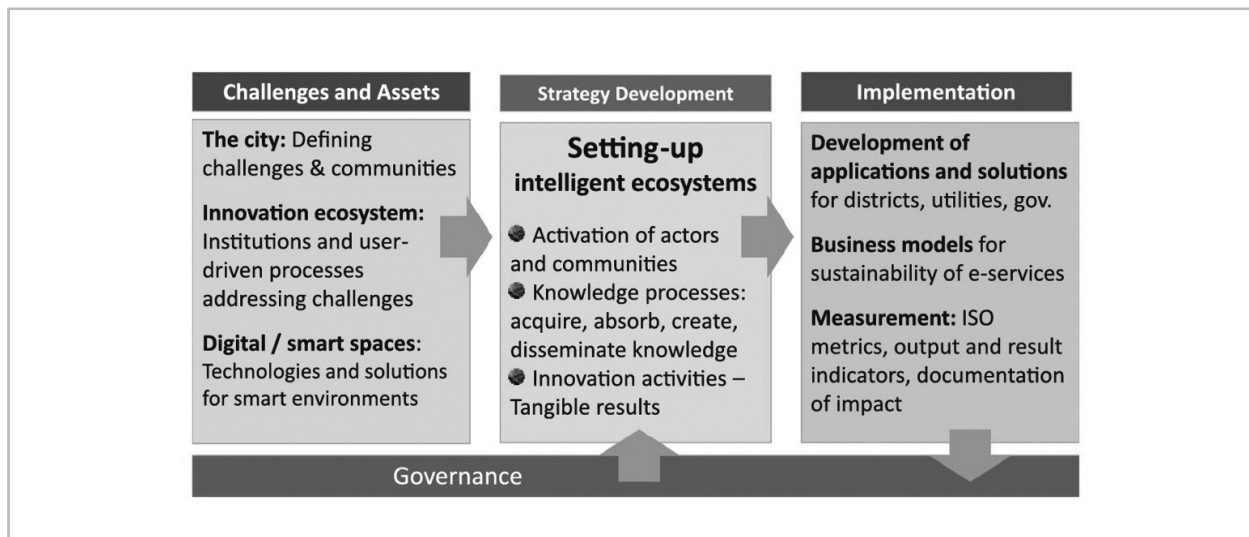


Fig. 4. A roadmap for smart city planning

Source: Komninos et al. (2018), p.15

While a strategic development policy document or plan is expected to have clear policy framework, actions and staging—such as in the Newcastle Draft Smart City Strategy—most of these policy documents are the first examples for the smart city context and thus crude in nature. Some of those even only developed to start a communication amongst the actors to form a more holistic strategy—such as Framework for a Smarter Toronto. The reason for the ad hoc nature of some these policy documents and plans are that they are developed just to inform other policy frameworks and plans of the city on the raising smart city phenomenon or issues—such as Smart, Connected Brisbane—until a fully-fledge city policy is developed. Additionally, most of the developed strategy documents aim to use the smart city brand to promote their cities’ name nationally and globally—such as Parramatta Smart City Masterplan.

Despite having numerous limitations, all strategy documents provided one important message, that is a need for a consolidated government policy—prepared in consultation with the key actors from public, private, academia sectors, and local communities—to provide a clear roadmap for how the city will be combatting its local and global challenges. This is an appropriate position for cities to take. Along with this, the issue of smart city governance was also mentioned in many of the policy documents—i.e., Brisbane, Greenwich, Newcastle, Ottawa, Toronto, Vienna. With the increase of the best smart city policymaking and governance practices, it is expected that

more cities will follow their footsteps and develop or adopt similar approaches in their urban policy mechanisms.

Today there is a rapidly growing academic literature on smart cities and sustainable urban development. At the same time technology companies are developing vast amount of smart city applications and smart city development is taking place in many corners of the world. However, most of the smart city initiatives are primarily focusing on making ‘cities smart’ rather than making ‘citizens smart’. As the literature evidences in order to make cities smarter, we need to make people smarter in the first place (Foth, 2018). In attempts to build smart cities, the missing element here is to-the-point, transparent and inclusively developed sound smart city policy—that also concentrates on investing on people. Fortunately, as this paper disclosed, there are some policy examples are appearing in recent years. While these examples are forming a good step forward, their limitations particularly in the smart city conceptualisation, and limited sustainability focus should be straightaway tackled. This sustainability problem is actually well beyond the smart city context. It actually should be a policy urgency to address immediately in all cities of the world.

Besides, the smart city planning policies, so far, showcased different practical approaches in different parts of the world. For example, there is a top-down policy and planning approaches to develop smart cities from scratch in Southeast Asia—e.g., Korea, China. However, in the North American, Eu-

ropean and Oceanian contexts a more participatory and retrofitting approaches are endorsed and practiced (Yigitcanlar, 2016). Even though, numerous smart city initiatives are taking place globally, thus far, there are no clear processes determined on how to plan smart cities. The ambiguity, on what a smart city is, is impacting on the smart city practice and making the planning process uniformed.

Nonetheless, some smart city scholars have been investigating this matter. For instance, a roadmap for smart city planning was recently proposed by Komninos et al. (2018). This road map is illustrated in Figure 4. According to this roadmap, the smart city planning goes far beyond the physical space design of our cities. The plans should address all of the grand challenges of 21st century life in cities—where these challenges and assets forms the first pillar of the roadmap. The second pillar of the roadmap is the strategy development. It helps in setting up intelligent ecosystems for the city. The third one is the implementation pillar. For successful implementation, competitive business models and international standards should be considered. Lastly, in every stage of the process governance and feedback loops should be engaged as good, efficient and effective governance is critical for a sound smart city planning (for further info see Komninos et al., 2018). Similarly, the sustainable smart city framework presented in Figure 3 also presents the planning process of smart cities by adopting an input-process-output model (IPO)—for further info on the smart city IPO planning process see Yigitcanlar et al. (2018a).

Above all, even it is not clearly elaborated in the abovementioned roadmap in Figure 4 or in the IPO model in Figure 3, the linkages between spatial, social, economic and technological domains of city planning should be carefully established. Furthermore, there is an urgent need for comprehensive, and perhaps revolutionary, smart city planning processes and mechanisms to develop the next generation sustainable smart cities. This is to say, smart city planning needs to be revisited particularly environmental sustainability issue must be strongly integrated in the planning process—along with having considerations for going beyond the current Anthropocentric urban planning and development mentality and practice.

There is, unfortunately, not a set rule or common practice on how cities considering various definitions and versions of the smart city model, and accordingly designing their planning mechanisms. Therefore, it is not easy to elaborate how cities, in general, reacted to the smart urbanism paradigm. Each city, so far, has their own story and comparing them while highly

invaluable, it is out of the scope of this paper. Post-Anthropocentric urbanism (or truly smart and sustainable urbanism), unfortunately, still remains a utopia and its planning mechanism is yet to be formulated. This is a critical prospective research area for scholars and planning practitioners to focus their attention on.

#### 4. CONCLUSION: TOWARDS TRULY SMART AND SUSTAINABLE URBANISM

The research reported in this paper investigated the smart city phenomenon and its planning practice approaches from an evolutionary perspective by reviewing the literature and examining the strategies of 15 renown smart cities of the world. These cities were: Birmingham, Greenwich and London from the UK; Brussels from Belgium; Edmonton, Ottawa and Toronto from Canada; Brisbane, Newcastle, Parramatta and Sunshine Coast from Australia; Wellington from New Zealand; Singapore from Singapore; Stockholm from Sweden; Vienna from Austria. The findings revealed that the current smart city efforts are not adequate enough to combat the challenges of the Anthropocene. Smart city policy, planning and development practice, at its best, is a zero-sum game for sustainability. This is to say, environmental gains are cancelled out by the impact of increased technology and energy use in the present smart cities (Ahvenniemi et al., 2017).

The biggest challenge currently faced is finding a way to change our mentality and politics on how we plan and shape our cities, societies and the environment. It is crucial to quickly adopt a post-Anthropocentric view point in our day-to-day living, business and urban development practices to move forward towards a sustainable planetary future. The Ecological Human Settlement Theory and the Theory of Change (Ibrahim et al., 2017) and guide us on how to build a post-Anthropocentric future (Liaros, 2018). Practice around this theory will create cohabitation spaces to house humans and non-humans (i.e., flora and fauna—and even in the future intelligent humanoids) in a sustainable and inclusive way in the ‘Post-Anthropocentric Cities’ or ‘Truly Smart and Sustainable Cities’ or ‘More-than-Human Cities’ of tomorrow—that are the truly smart and sustainable cities. This helps us establish a truly smart and sustainable urbanism paradigm. The term of truly smart and sustainable urbanism has not been fully formulated yet, but it can be rather vaguely defined as:

*“Truly smart and sustainable urbanism is an urban development paradigm that is the antidote of current spatially, structurally, socially, ecologically imbalanced and vicious Anthropocentric urbanism practice”.*

This more-than-human view does not argue that cities are not for people. On the contrary, it advocates that cities should be the natural co-habitation places for all—i.e., people, flora, and fauna. Hence, replanning, redesigning and rebuilding cities as locations of co-habitation and co-existence are critical to avoid or at least minimise the catastrophic consequences of the dramatically human-modified world of the Anthropocene era. Otto (2018) discloses some of the consequences as acidity of oceans, fragmentation of landscapes, raising temperature of climate, less natural and wildlife, biodiversity loss, highly homogenised environments, reduced rate of biological speciation, diseases and their vectors becoming better adapted to life within cities, and so on.

In order to plan and promote the development of next generation smart and sustainable cities, or more-than-human cities, it is also important to stimulate prospective research and further critical debates on this topic as widely as possible. This is to say, current smart city planning practice needs to be carefully and critically revisited. Firstly, we need to bring the more-than-human cities into the political arena in order to spark a serious debate about the kind of city we all want to live in and leave for the next generations. Secondly, as Knight (1995) and Yigitcanlar and Bulu (2015) foresaw, we need a new approach to city development that is to focus on knowledge-based (urban) development. However, here the meaning of the term ‘knowledge’ is greater than its current narrow comprehension of capitalist knowledge economy (Millar and Ju-Choi, 2010; Yigitcanlar and Inkinen, 2019). In order to contribute to the smart city debate and its better conceptualisation, this paper provides the following consolidated definition of smart and sustainable cities:

*“Smart and sustainable city is an urban locality functioning as a healthy system of systems with sustainable and balanced practices of economic, societal, environmental and governance activities generating desired outcomes and futures for all humans and non-humans.”*

This reconceptualization of smart and sustainable cities gen-

erates a new understanding for urban planners, managers and policymakers. Building on this foundation, we can shape the new planning paradigm and practice—that is truly smart and sustainable urbanism—to achieve desired outcomes and futures. However, one thing is sure that with current levels of poor community awareness and political irresponsibility all across the globe, we are rapidly moving towards to an urban ecocide. The sixth extinction is already upon us (Celablllos et al., 2015). Building more-than-human cities for truly smart and sustainable futures might be the last resort for the humankind to evolve and avoid the approaching urban ecocide or not go extinct in the not too distant future.

This is to say; today human civilisation is standing at the crossroads. Fortunately, there are some policies being prepared at the global level by United Nations (UN). For example, one of the domains of change of the Draft UN-Habitat Strategic Plan 2020-2025 focuses on ‘strengthened climate action and improved urban environment’. This domain of change contains the following priority areas: (a) Improved protection of urban biodiversity and ecological assets; (b) Reduced greenhouse emissions and improved air quality; (c) Improved resource efficiency and sustainable waste management; (d) Effective adaptation of cities’ infrastructure to climate change (UN-Habitat, 2018). However, actions to be taken across the world at the city-level in the best-case scenario will take decades.

This might be too little to late, as the recently released special report from the Intergovernmental Panel on Climate Change (IPCC) has put clear scientific evidence on that we have to start creating our low-carbon future today without any further delay—we have only 12 years left to act on climate change (IPCC, 2018). In theory, the smart and sustainable city poses an opportunity to create such future. A number of critical decisions, however, must be taken and implemented immediately. For example, we need to move away from an aggressive population, urban and economic growth dominant viewpoint and practice. We also need to revolutionise political mechanisms to deliver long-term goals for the communities at large and the environment. Furthermore, the urban planning and development discipline also has serious responsibilities. This includes finding the right answers to the following questions, which are extremely critical for our future existence on the planet and its living conditions:

- a) Will urban scholars, planners, designers and activists be able to convince urban policymakers and the general public of the urgent need for a truly smart and sustain-

able urban turnaround?

- b) How can we—public, private and academic sectors along with communities jointly—pave the way for more-than-human cities and truly smart and sustainable futures?

Lastly, the ancient Chinese curse, “*may you live in interesting times*”, is becoming a reality today for all humanity. We are currently going through very interesting (or more accurately challenging) times that our impact on the planet, particularly since the end of WWII, is being reflected back at us with catastrophic global climate change and immense biodiversity loss. Today, we are at the verge of an urban ecocide and the sixth extinction is not that far away. We need to, without any delay, get our act together and find a sustainable way to continue our existence on the planet. There is a prominent role for and responsibility of urban scholars, planners, managers and policy-makers in finding such sustainable way of living and coexisting with non-humans in harmony.

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