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Leonidas Anthopoulos *Editor*

Smart City Standardization

A Global Perspective

Springer

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Smart City Standardization

A Global Perspective

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Foreword

The 21st century is witnessing an unprecedented urbanization surge. Cities, as the epicenters of economic growth and innovation, are grappling with complex challenges such as climate change, inequality, and resource scarcity. To navigate these complexities and build sustainable, resilient, and inclusive urban environments, a standardized approach is imperative.

This book, *Smart City Standardization: A Global Perspective*, is a timely exploration of the critical role that standardization plays in shaping the future of our cities. It explores the multifaceted landscape of smart city standards, from global frameworks to regional and national initiatives.

At the heart of this endeavour is the United for Smart Sustainable Cities (U4SSC) initiative, a collaborative effort by 19 UN bodies, that provides cities worldwide with the tools and guidance needed to embark on their smart city journeys. By focusing on Key Performance Indicators (KPIs), U4SSC empowers cities to measure progress, identify areas for improvement, and ultimately enhance the quality of life for their citizens through building smarter, greener urban environments.

The International Telecommunication Union (ITU) has also emerged as a pivotal player in the standardization arena. By fostering collaboration among 193 UN nations, the ITU is driving the digital transformation of cities and laying the groundwork for a more connected and equitable world.

Beyond the international stage, this book delves into specific case studies of smart city standardization initiatives across the globe. From the United States' private sector-driven model to Spain's emphasis on smart tourism, and from China's focus on interoperable platforms to Japan's commitment to disaster resilience, this book offers a comprehensive exploration of diverse approaches to smart city standardization. The readers are also introduced to innovative projects such as France's Proxi-Produit, a proximity-based citizen service utilizing IoT, and Brazil's intelligent platform, a sophisticated system for assessing and improving smart city development across thousands of municipalities.

I have had the privilege of collaborating closely with Prof. Leonidas Anthopoulos at the International Telecommunication Union (ITU), the UN's specialized agency for ICTs, on the pre-standardization of CitiVerse, a new UN framework for citizen-centric future smart cities leveraging cutting-edge technologies which leads to international standards. Professor Anthopoulos' profound knowledge of the global smart city standardization landscape has consistently impressed me.

His new book on *Smart City Standardization: A Global Perspective* is a vital resource for policymakers, urban planners, technologists, and anyone interested in the future of our cities. By understanding the global landscape of standardization, we can accelerate the development of smart, sustainable, and inclusive urban environments that benefit all.

I am confident that this work will contribute to the development of a global framework for smart city standardization, ultimately leading to more sustainable, resilient, and equitable urban futures. Let us embark on this journey together to build a better tomorrow for all citizens.

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Introduction: Navigating the Landscape of Standardisation for Smart Cities

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Constantinos Marios Angelopoulos and Ramy Fathy

Abstract

Cities are the cradle of human societies and modern civilization. Following the agricultural revolution in circa 10,000 BC, the emergence of the first cities marked the transition from hunting and gathering communities to settled societies.

1.1 Smart Cities and Standardization

Cities are the cradle of human societies and modern civilization. Following the agricultural revolution in circa 10,000 BC, the emergence of the first cities marked the transition from hunting and gathering communities to settled societies. Depending on the socio-economic and geo-political environments, cities around the globe have assumed different development paths. However, in all cases, cities have been driving progress in terms of governance, commerce and economic growth, culture, science and technology, and every other facet of human societies.

Along with the increase in human population and the ever-increasing interconnectedness of societies, cities also increase in size, further amplifying their importance. In their report "Metropolitan Areas" (OECD 2015), OECD review the impact of 281 metropolitan

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areas and find that 49% of the OECD population lived in that areas, generated 57% of gross domestic product (GDP) and 51% of employment in the OECD area. The report also found that metropolitan areas tend to be more productive than the rest of the economy, with the productivity gap (GDP per worker) being on the average 30% (OECD 2015). More recently, Eurostat came to similar findings regarding the impact of capital cities and metropolitan regions in European Union; their combined gross domestic product (GDP) was €3.1 trillion in 2019, which equated to 22.6% of the EU total (Eurostat 2024).

The capacity of cities to deliver this significant impact over time is largely driven by novel processes of governance and organisation, often underpinned by scientific and technological breakthroughs. More efficient urban planning, development of power and transport networks, and effective waste management are few indicative examples. In recent years, disruptive emerging ICTs have paved the way for the digitalisation of most of these processes. Digital systems and networks now enable the collection, curation, and processing of dense data in both space and time domains. This in turn enables better-informed process design and policy making at shorter and more frequent development cycles. The impact of emerging ICTs has been such, that a new paradigm has emerged; the paradigm of a Smart City.

Given the unique profile of each city and the highly diverse and fast evolving landscape of ICTs, how to effectively on-board new digital technologies is not a straightforward exercise. Each city has its own priorities and faces different challenges, and it may have access to a different set of digital technologies depending on the ambient socio-economic and geo-political environments. Furthermore, there are multiple stakeholders involved, often with competing interests—public administration, industry, academia, NGOs, etc.—among which compromises need to be reached more often than not. International standards developing organizations (SDO) constitute important *fora* for city stakeholders to exchange lessons learnt, disseminate good practices, and develop a common vision and understanding that will further facilitate the delivery of positive impact to citizens via economic growth and improvement of quality of life.

In the following, we focus on the domain of Smart Cities and first discuss how the corresponding standardisation landscape has been shaped by emerging ICT to now also include additional stakeholders. We also share our experiences from developing an international standard in the domain of Smart Cities underpinned by research in ICT. Apart from the technical work, the process also involved navigating the regulations governing the SDO, as well as the relationship dynamics among a diverse corpus of stakeholders for obtaining consent for the adoption of the standard. This chapter aims to serve as a gentle pre-ample to the remaining chapters of this tome presenting standardisation activities from several regions of the world in the Smart Cities domain.

1.2 Standardization "Within", "Outward", and "Beyond"

The development of widely adopted technical standards is a key mechanism for technology commercialization and economic development. Technical standards are the main vehicle supporting interoperability among different technologies and their implementations, thus greatly facilitating the establishment of a common reference framework for the involved stakeholders. This common reference creates the stable environment needed for technologies under research to be successfully commercialized; *industry* is provided with needed guarantees for investing in the development of products and infrastructure (e.g., in the case of Mobile Network Operators); *end-users* are more willing to onboard new technologies as the risk of being locked to a single vendor is (at least partially) mitigated; *policy makers* are able to take initiatives without the need to target specific solutions; *consumers* are guaranteed access to a variety of products and services. The overarching aim is to maintain open markets that encourage technology development and innovation. To this end, standardisation needs to be carefully balanced such that it does not favour or indirectly dictate product or vendor specific solutions.

A way to achieve this objective is by assuming an inclusive approach in standards development. This entails the engagement of multiple stakeholders with different scopes of authority and interest. We identify three coarse categories of SDOs, each one with its own distinct scope of work.

Standardization "within": The first category regards core technical SDOs strongly focusing on the technical aspects of the technology they study. The stakeholders involved in such SDOs primarily come from the industry and regard those who develop products or provide services. In such SDOs national/regional policymakers are also involved as technical solutions often require harmonising corresponding legislation (such as in the case of spectrum allocation). An example of such an SDO is the European Telecommunications Standards Institute (ETSI)[1] that has developed widely adopted telecommunications standards, such as the GSM.

"Outward" Standardization: The second category of SDOs regards harmonization of standards across different SDOs and regions. The aim is to harmonise the development of standards in the context of a globalised market and tightly interconnected world. An example of such an SDO is 3GPP,[2] a consortium with seven national or regional telecommunication standards organizations as primary members ("organizational partners") and a variety of other organizations as associate members ("market representation partners"). Example standards developed and maintained by 3GPP include the various generations of mobile telecommunications (3G, 4G, 5G, etc.).

[1] https://www.etsi.org/.

[2] https://www.3gpp.org/.

Standardization "beyond": The third category of SDOs regards high-profile international organisations where national and regional policymakers and regulators are actively involved alongside other stakeholders such as from industry, academia, and other. An example of such an SDO is the International Telecommunications Union (ITU)[3] whose activities are mainly driven by national delegations. Such SDOs have the mandate to develop policies at the international level and are crucial in the global management of resources, e.g., the ITU Radiocommunication Sector (ITU-R) plays a vital role in the global management of the radio-frequency spectrum and satellite orbits. At the same time, organizations of this category provide an inclusive forum for activities in emerging domains with the participation of a wider set of stakeholders. For example, Study Group 20 of ITU-T is very active in producing outputs (Recommendations, Supplements and Technical Reports) in the domain of Smart Cities and Communities.

1.3 Scoping the Future: Experiences in Standardisation for Smart Cities

Smart Cities employ digital technologies to improve processes and services with the aim of providing their citizens with improved quality of life and prosperity. In this context, industrial stakeholders have been considered technology providers and enablers, whereas local authorities and citizens have typically been regarded as end users and beneficiaries. However, recent technological advances and newly emerged ICT paradigms now provision more central roles for local authorities and citizens.

An indicative example is that of Neutral Hosting (NH) in Smart Cities. Neutral Hosting is a network model where telecommunications infrastructure is shared among mobile network operators (MNOs) for a pervasive infrastructure deployment (Paolino et al. 2019). The model allows to mitigate business issues related to thin client base in certain areas (e.g., rural areas) that have a detrimental impact on the ROI (return on investment) of deploying networking infrastructure (e.g., cellular masts). The NH model now provides the technical means for local authorities to deploy their own "dark" cellular infrastructure which can then lease to MNOs. This is also relevant with regard to mmWave infrastructure, where the local knowledge of the deployment area is of particular importance.

A second example is the paradigm of crowdsourced systems, which provisions the use of crowdsourcing methods in developing digital networked systems. In particular, the paradigm provisions the use of devices and infrastructure provided by the general public in the context of systems delivering a service. In academic literature the paradigm of crowdsourced systems has attracted attention, such as in developing distributed localised cloud services (Hosseini et al. 2019) and studying incentive mechanisms to encourage public engagement (Angelopoulos et al. 2015). However, being a novel and emerging

[3] https://www.itu.int/en/.

paradigm meant that key concepts and terms remained largely undefined, thus hindering the development of a commonly understood framework.

1.3.1 ITU-T Y.4205: Requirements and Reference Model of IoT-Related Crowdsourced Systems

Identifying the increasing interest showed by the academic community in the emerging paradigm of crowdsourced systems and its potential for future impact, a proposal to establish a corresponding work item was put forward in ITU-T Study Group 20: Internet of things (IoT) and smart cities and communities (SC&C).[4] ITU-T SG20 was chosen due to its mandate "*to develop international standards (ITU-T Recommendations) providing commonly agreed guidance for implementing the Internet of Things (IoT) and its applications, as well as smart cities and communities*". Question 5, which studies emerging digital technologies, terminology and definitions, was considered to be the standardisation forum best fit for developing definitions and a reference architecture for crowdsourced systems. As a result, a work item was initiated in 2016 with the aim of developing a corresponding ITU-T Recommendation.

ITU-T Recommendations are standards defining how telecommunication networks operate and interwork (ITU). These can be accessed through the links below. ITU-T Recs have non-mandatory status until they are adopted in national laws. The level of compliance is nonetheless high due to international applicability and the high quality guaranteed by ITU-T's secretariat, and members from the world's foremost information and communication technology (ICT) companies and global administrations (ITU).

Recommendation Y.4205: "*Requirements and reference model of IoT-related crowdsourced systems*" (ITU-T 2019) was approved for publication in 2019. The standard introduces the concept of crowdsourced systems, as well as the reference model of IoT-related crowdsourced systems for the support of Internet of things (IoT) applications and services to be provided via systems employing crowdsourcing principles. It addresses IoT-related crowdsourced systems in terms of functional requirements and the reference model as well as identifying relevant security, privacy and trust issues (Fig. 1.1).

More specifically, *crowdsourcing* is defined as the practice of obtaining needed services, ideas, content or other system resources by soliciting contributions from a large, open and potentially undefined group of people, rather than from employees, suppliers or identified experts through an online open call by providing incentives (financial, social, or entertainment) to all or a subset of those crowd members who participate in the crowdsourcing activity (ITU-T 2019). Also, a *crowdsourced system* is defined as a system that employs crowdsourcing to augment their constituent infrastructure and the set of provided services or collected information. These are the first formal definitions in literature for these terms.

[4] https://www.itu.int/en/ITU-T/studygroups/2022-2024/20/Pages/default.aspx.

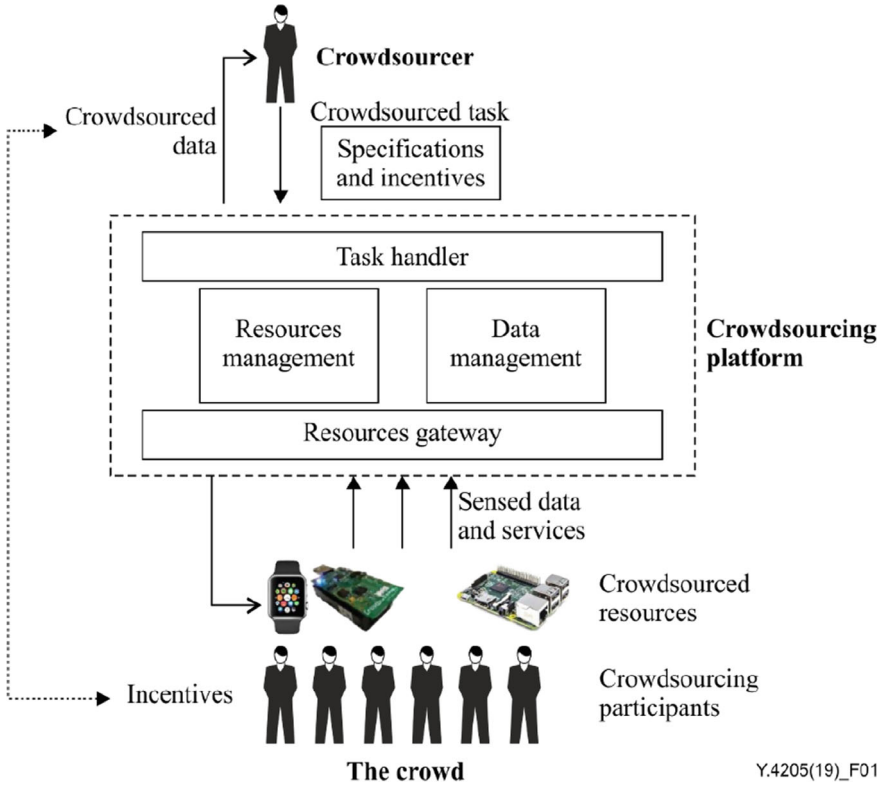

Fig. 1.1 The reference model for IoT-related crowdsourced systems (ITU-T 2019)

1.3.2 Lessons Learned and Experience Gained

The path towards successfully developing an international standard is an onerous but a rewarding one. First and foremost, the proponent should be familiar with the processes and various approval stages of the corresponding SDO. For newcomers, this may involve a steep learning curve, particularly if there is limited experience in standardisation in general. Support or collaboration with experienced colleagues that will double as mentors can be crucial in accelerating the process. Secondly, one should bear in mind that in the corpus of an SDO, almost by definition, all participants carry very high expertise. Albeit this expertise may be in different, not strictly technical topical areas—e.g., experts in patents with legal background—in the context of standardisation, this is highly relevant. Therefore, a proponent should be prepared to address any issues arising from language gap in the understanding of novel technical or scientific terms. Thirdly, in several cases agreement on publishing a standard is reached by consent (such as in the case of ITU-T) and therefore one should be ready to make compromises and reach the middle ground. As

an example, in the development of Y.4205 specific algorithmic solutions were proposed for providing incentive mechanisms to crowdsources (the contributors from the public). However, the working group of experts raised concerns regarding whether making a reference to specific algorithms could prohibit future approaches by being considered as non-compliant. Overall, the experience gained from the development of Y.4205 has been a largely positive one. Although one needs to navigate a complex landscape of regulations, policies and balancing of opposing views, the process guarantees a high-quality outcome the broadest possible acceptance.

1.4 Conclusions

Smart Cities is a paradigm provisioning the use of digital services and networks to improve the quality of life and prosperity of citizens. The use of emerging ICT now supports the collection, curation, and processing of dense data in both space and time domains. This enables informed decision making and services planning in Smart Cities operations, thus driving further improvement and growth. The development of corresponding international standards is a key vehicle in developing solutions that are interoperable providing stakeholders with a common reference framework that guarantees an open market, a diverse set of available solutions and affordable costs.

The standardisation landscape is itself very diverse with a variety of standards development organisations with varying scopes and aims. They form a non-normative hierarchy with SDO activities "within", "outward", and "beyond" the scope of individual topical areas. The book you hold in hand in its following chapters provides valuable insights in standardisation activities in the domain of Smart Cities by high-profile SDOs across different regions of the world. This is a valuable collection of case studies providing the reader with a unique viewpoint that will inform the strategy of future standardisation efforts.

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Prof. Constantinos Marios Angelopoulos is Professor of Networked and Sensing Systems at Bournemouth University (U.K.), working on future and emerging paradigms of networks and networked systems. He is the founding Program Leader of the three Internet of Things Master courses and founded and leads the BU Open Innovation Lab. Since 2018, he serves at the International Telecommunication Union as Rapporteur in ITU-T SG20: Internet of things (IoT) and smart cities and communities (SC&C). His research has been published in highly esteemed peer-reviewed journals and conferences and has attracted external funding from several funding bodies (H2020, Horizon Europe, DCMS) and directly from Industry.

Dr. Ramy Ahmed Fathy is a senior standardisation expert carrying more than 15 years of experience in senior management roles. He is the Vice Chairman of ITU-T Study Group 20 on IoT and its Applications including Smart Cities and Communities, Co-Chairman of ITU-T SG20 Working Party 1, Chairman of Regional Group Africa, Chairman of ITU/FAO Focus Group on AI and IoT for Digital Agriculture. He is also Chief Expert of Digital Technologies and Public Policy in National Telecom Regulatory Authority, Egypt. His 15 years of key expertise include projects in the fields of cryptography (PKI), automation, analogue TV switch-off and DTV transformation, 4G business case development, market modelling, intelligent transportation systems (design—specifications—business case), and smart cities services ICT requirements and specifications.

Part I
The Context of Smart City Standards

What KPIs Can Reveal and Help Achieve

2

Barbara Kolm and Victoria Schmid

Abstract

Today, cities account for almost 50% of the world's population and 80% of the global GDP. These percentages are only expected to grow as more people move into the cities. Urbanization is a source of economic growth and development, but it can also be a source of challenges: overcrowding, disease, pollution, congestion, crime, and inequality (UN Trade and Development (UNCTAD), Four key challenges facing least developed countries. UN Trade and Development, 2022). If policy makers want to mitigate these risks, they have to engage in smart and sustainable city planning. The United for Smart Sustainable Cities (U4SSC), an initiative aimed at helping cities become more sustainable, can provide guidance to city planners who intend to make their cities resilient, sustainable, and inclusive.

Keywords

Smart sustainable city • KPIs • Sustainable development goals • U4SSC • ITU

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2.1 Introduction

The phrase "smart city" inevitably recalls scenes from sci-fi movies: self-driving cars, virtual reality and robot assistants. These cities undoubtedly exist. Chinese and American cities alike are at the forefront of self-driving car testing and implementation. This is however a reduction of what a smart city is. A smart city can adopt technological innovations such as automated vehicles, multifunctional robots, or augmented reality. However, what makes a city "smart" goes beyond these technological amusements. Smartness does not embellish cities through technological innovations. But then, what makes a city smart? Robots? LED screens? To help cities become "smart", a set of initiatives such as the *United for Smart Sustainable Cities* initiative have been developed to guide cities in their path to "smartness" and to help them assess their progress towards it (International Telecommunication Union (ITU) n.d.).

Today, there are three internationally recognized bodies that produce guidelines or standards to help cities in their pursuits to become smart: the International Telecommunication Union (ITU), the International Organization for Standardization (ISO), and the International Electrotechnical Commission (IEC). These bodies produce standards within their expertise.

The International Telecommunication Union (ITU) is at the forefront of issuing guidelines for cities in their path towards "smartness" and sustainability. Established in 1865 to manage the first international telegraph networks and recognized in 1947 by the United Nations as its specialized agency for telecommunications, today the ITU is the United Nations specialized agency for information and communication technologies (ICTs) (International Telecommunication Union (ITU) (n.d.-b)). Among many other initiatives, the ITU launched in May 2016 the United for Smart Sustainable Cities (U4SSC) initiative (United Nations Economic Commission for Europe (UNECE) and International Telecommunication Union (ITU) n.d.). The U4SSC was launched to achieve the United Nations' Sustainable Development Goal (SDG) 11: Make cities and human settlements inclusive, safe, resilient, and sustainable. The U4SSC is a global public policy platform intended to promote the adoption and implementation of information and communication technologies and digital technologies to help cities transition into smart sustainable cities.

Today, cities account for almost 50% of the world population and 80% of the global GDP and are "responsible for close to 70% of global CO_2 emissions associated with energy consumption (International Telecommunication Union (ITU) 2016)." The importance of cities as economic and cultural hubs is undeniable and bound to increase as the share of the global population in cities is projected to rise from its current 48% to a staggering 58% in 2070 (UN-Habitat 2022). Population growth and urbanization will inevitably give rise to opportunities as well as to challenges. If unaddressed, urbanization, however, will pose significant challenges to citizens and governments alike. Without proper infrastructure, cities might be unable to deal with the economic, social, and environmental challenges that might arise because of population growth. Economic prosperity,

social wellbeing, and environmental sustainability depend on policy makers' abilities to anticipate and address those future challenges. Smart and sustainable planning of cities is necessary to avert future crises.

2.2 Why Cities?

For the past 70 years, the world has witnessed notable population growth and urbanization rates. "In 1950, most people lived in rural areas, followed by towns and semi-dense areas, while cities were the least inhabited (UN-Habitat 2022)." Today, the order is reversed: most people live in cities, and the fewest people inhabit rural areas. By 2020, around 48% of the global population lived in cities, while 29% lived in towns and semi-dense areas, and 22% in rural areas. Population growth has decelerated and is expected to slow down even more. Urbanization, on the other hand, is expected to increase. According to the UN World Cities Report's estimates, the percentage of the world population inhabiting cities is expected to grow to 58% by 2070, while the world population in towns and semi-dense areas is expected to decrease to 24% (UN-Habitat 2022).

Urbanization is the inevitable consequence of a higher per-capita income in cities compared to that of rural areas. However, migration to urban areas is nothing new. The industrial revolution reshaped most of the world economy, turning rural agrarian societies into industrial economies; this, in turn, led to urbanization as labor shifted from farms to factories. Many laborers in the UK, the Netherlands and the US looking for better opportunities resettled in urban areas where wages were higher compared to those of the countryside. Nonetheless, even if wages were higher, working conditions in cities were dreadful. Death rates in cities were higher in comparison to those of rural areas:

> Urban mortality was indeed so high that, were it not for continual migration from the countryside, the cities would have faded from the earth. In London from 1580 to 1650, for example, there were only 0.87 births for every death. Without migration the city would have lost about half percent of its population every year. Early towns were generally crowded and unsanitary, so that infectious diseases such as plague, typhus, dysentery, and smallpox spread quickly (Clark 2010).

Despite London being one of the richest cities in the world, the life expectancy of its inhabitants at the end of the eighteenth century was merely 23 years—a lower life expectancy than that of most pre-industrial societies. It would take almost a hundred years for this to improve. As Jared Diamond noted: Not until the beginning of the twentieth century did Europe's urban populations finally become self-sustaining: before then, constant immigration of healthy peasants from the countryside was necessary to make up for the constant deaths of city dwellers from crowd diseases (Diamond 2017).

These unsanitary conditions have been eradicated in most Western cities. Today, London is no longer the unsanitary and death-ridden slum it was during the Georgian era.

According to the latest released data from the 2020–2022 Office of National Statistics census, life expectancy in London was 79.1 years as of the 2020–2022 period—almost 56 years longer than the average life expectancy of 23 in 18th-century England. Unsanitary conditions, however, are still prevalent in the Global South cities where overcrowding, poor sanitary conditions, crime, scarce resources, climate change, outdated infrastructure and pollution are rife. As of 2019, the 20 countries with the lowest life expectancy were in the Global South (Table 2.1). In 2019, these 20 countries had a meager life expectancy at birth of only 60.02 years.

The challenges that the Global North cities face are different from those of the Global South. However, there are some overlaps: overcrowding, rising crime rates, unemployment, climate change, outdated infrastructure, among many others. These and other challenges exclusive to the Global North such as an ageing population, social and political polarization, and a shrinking labor force jeopardize economic productivity and the welfare of the cities' inhabitants.

Table 2.1 Average life expectancy in the countries with the lowest life expectancy at birth (World Health Organization (WHO) 2020)

	Country	Life expectancy at birth (in years)
1	Lesotho	50.7
2	Central African Republic	53.1
3	Somalia	56.5
4	Eswatini	57.7
5	Mozambique	58.1
6	Kiribati	59.4
7	Chad	59.6
8	Guinea-Bissau	60.2
9	Zimbabwe	60.7
10	Sierra Leone	60.8
11	Guinea	61
12	Botswana	62.2
13	Equatorial Guinea	62.2
14	Cameroon	62.4
15	Democratic Republic of the Congo	62.4
16	Zambia	62.5
17	Nigeria	62.6
18	Burkina Faso	62.7
19	Mali	62.8
20	South Sudan	62.8

Urbanization will pose significant challenges in the future. Economic growth and citizen flourishment depend on policy makers' abilities to deal arising issues. But to tackle these issues effectively policy makers will have to anticipate change, correct the course of action and implement effective policies.

2.3 What is a Smart City?

Today, cities account for almost 50% of the world population and 80% of the global GDP. In both the Global North and South, citizens leave their communities in search of better opportunities in urban areas. This is hardly any surprise. Higher population densities, lack of opportunities in rural areas and centralization make cities desirable destinations for those looking to make a living. But that is only half of the story: cities mean opportunities for individuals while for countries, "cities are the engines of productivity and the workhorses of development (Fikri and Juni Zhu 2015)." Cities themselves act as economic and cultural networks that help connect workers with firms, craftsmen with customers and artists with an audience.

Cities thrive on agglomeration. A higher population density or agglomeration creates networks, brings in new stakeholders and accelerates processes that are crucial for development (Lozano-Gracia and Soppelsa 2019). This, however, gives rise to new challenges: disease, pollution, congestion, crime and inequality. It is partly inevitable. Because the same crowds that allow ideas to spread allow diseases to spread. The networks that connect people and allow markets to flourish allow criminal networks to operate. The closeness that facilitates trade facilitates crime, too. Competitiveness gives rise to congestion and congestion to pollution. And the cities' wealth attracts poverty as the destitute find work and opportunities in the cities, hence creating inequality. This paradoxical phenomenon is labelled the "demons of density"—a concept alluded to by Harvard economist Edward Glaeser in his book *The Triumph of the City* (Glaeser 2008).

As urbanization is poised to increase, so are the density demons. These demons ought to be cast out and if policy makers want to do so effectively, they must engage in sustainable and smart city planning. And the United 4 Smart Sustainable Cities (U4SSC) initiative provides the guidelines and tools to do so.

But first, what is a "smart sustainable city"? The ITU, the UN telecommunication agency, defines a smart sustainable city as:

> An innovative city that uses information and communication technologies (ICTs) and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social, environmental as well as cultural aspects (International Telecommunication Union (ITU) 2016).