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Smart and Sustainable Cities: The Role of Governance and Innovation Policy*

Note by the secretariat

I. Introduction

1.   This note reviews the role of cities as hubs for innovation for sustainable development, what constitutes a smart and sustainable city and why innovation is at the centre of this transformation. It is based on the discussions at the substantive segment on "Smart and Sustainable Cities: The Role of Governance and Innovation Policy" of the twelfth session of the Team of Specialists on Innovation and Competitiveness Policies, held in Geneva on 5 and 6 December 2019.[1] The event brought together representatives of government, academia, the business sector, civil society, and international organisations.

2.   Following this introduction, the second section explores the concept of smart and sustainable cities. The third section explores how cities can be drivers of innovation and sustainable development. The fourth section outlines specific tools for this purpose, while the fifth explores the importance of and means for enabling broad citizen engagement. The sixth section discusses the role of clear performance indicators and monitoring and evaluation more broadly. The seventh and final section summarises the discussion and recommendations.

II. Smart and sustainable cities: the concept

3.   Initially, the concept of "smart cities" was widely used as a trigger and framing device to upgrade urban economies through the increased efficiencies gained by the widespread adoption of new information and communication technologies (ICTs) in sectors such as transport, buildings, or energy and ICT, and the upgrading and inter-linking of infrastructures which the new ICTs made possible.

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*   This document was originally submitted to the 2020 session of the Committee on Innovation, Competitiveness and Public-Private Partnerships which was cancelled due to restrictions related to COVID-19. The document is re-issued under a 2021 document symbol.

[1]   The presentations can be found here.

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4. More recently, the concept of "smart *and* sustainable cities" has emerged, providing a more holistic view of the manifold social, cultural, environmental and financing aspects involved in ensuring that smart city initiatives contribute to sustainable development. Increasingly, governments recognise that the success of smart sustainable city projects is not determined by investments in hard technologies or technical capital alone, but also depends on leadership, stakeholder coordination and citizen engagement to ensure that technology meets economic, ecological and social needs.

5. This and similar approaches mark a departure from what often was an overweening focus on top-down investments in infrastructure, including broadband infrastructure and e-government services (smart cities 1.0) in favour of a more bottom-up approach, enabling and creating platforms for drawing on ideas of citizens, entrepreneurs, researchers, and policy makers (smart cities 2.0). This paradigm shift, from a technology and infrastructure-focussed view of smart cities to one that enables and provides platforms for broad experimentation with new ideas for the benefit of all, aims to "leave no one behind". More and more cities have turned to the broader vision of "smart sustainable cities" not only to improves cities' competitiveness and economic productivity, but also the quality of life of people, and environmental sustainability.

6. This ambitious pursuit takes place in a rapidly urbanising world, including the ECE region where urban areas already host over 75% of the population in Europe, 80% in North America, and close to 50% in Central Asia. Moreover, many cities are facing a range of sustainable development issues, including traffic congestion, unsustainable use of energy and other resources, pollution, threats to human health, ineffective waste management and unaffordable housing.

7. Innovation is critical in responding to these complex challenges – not only for the cities themselves, but in contributing to sustainable development on a larger, even global scale, and as a means to fulfil the 2030 Agenda for Sustainable Development, including Sustainable Development Goal 9, "Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation" and Goal 11, "Make cities and human settlements inclusive, safe, resilient and sustainable". Cities can play a key role as laboratories to develop and test innovative solutions to sustainability challenges, including for instance in the area of sustainable consumption and production (SDG 12)

8. While there is no generally accepted definition of a "smart and sustainable city", the pivotal role of innovation, the integration of information and communications technologies, the aim of enhancing efficiency of urban operations and services, and the imperative to meet citizens' economic, social, environmental and cultural needs are commonly recognised as central to the concept of smart and sustainable cities.

III. Cities as hubs of innovation and sustainability solutions

9. Leading cities are hubs of economic dynamism overall and innovation in particular. Across the world, just 380 cities contributed half of global GDP.[2] The reason is that urban areas have the potential to bring together the central ingredients for innovation: entrepreneurs, capital, responsive government, sophisticated consumer demand, skills, research institutions, cultural vibrancy, and capital. This is extremely valuable, as is evident from the fact that, despite tremendous advances in technology and connectivity, many highly innovative multi-national companies still retain their locations in cities such as London and the San Francisco Bay Area despite the prohibitive costs of living and high wages they have to pay. Making sure cities thrive, and that the benefits are shared efficiently and equitably, is central to sustainable development.

10. Recognising this as well as the growing importance of making optimal use of technology, leading cities throughout the ECE region have recently strived to better integrate technology with infrastructure and social objectives, and to enhance their inclusiveness and

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[2] https://www.mckinsey.com/featured-insights/urbanization/urban-world-mapping-the-economic-power-of-cities

the active participation of all citizens, including women, senior citizens, lower income groups, and marginalised groups of society.

11.   There is in fact a risk that digital technologies themselves, such as artificial intelligence, may introduce or even exacerbate biases in policy design and service delivery against, for instance, women. Artificial intelligence and machine learning are based on data, and many data collected today are "gender-blind" and do not adequately reflect women's life experiences and needs. As a result, needs and solutions generated with the help of machine learning may identify male needs as the standard and may not cater adequately to the needs of half the population.

12.   A case in point is municipal transport infrastructure developed predominantly based on average male user patterns, i.e. linear travel trajectories between home and work and relatively heavy use of private rather than public transport. Gender-disaggregated data show that on average, women use public transport more often than men, and their travel trajectories more often involve multiple stops between home and work, such as to take children to see the doctor, or pick them up from school. To manage the risk of digital technologies exacerbating this kind of bias, data should be collected on a gender-disaggregated basis, and women and men should both be represented adequately in policy design and service delivery. Similar attention should be paid to avoiding any biases according to age or disability.

13.   Policy coordination between central, regional and municipal governments is critical when building and fostering smart and sustainable cities. Canada was mentioned as a good practice example due to its bottom-up approach. One initiative was the "smarter cities challenge", where residents were given the opportunity to voice their concerns and their proposals to improve their cities. The government also set up an infrastructure bank, which allowed risky, innovative products to obtain financing. The "Smart Qatar" and "Smart Portugal" initiatives allow national and local level governments to cooperate and coordinate their objectives and financing.

14.   Central governments need to provide the overall vision and the enabling environment for the transition to smart sustainable cities. They also have a role to play in financing or underwriting finance for initiatives implemented at the city level

15.   Despite the emergence of many successful smart and sustainable cities, there are no one-size-fits-all templates that can be universally applied to create smart and sustainable cities. Solutions need to be adapted to the local context and the focus should be on the desired outcomes, rather than perceived problems and deficits. Simply copying ideas that may have proven useful in one context would be misguided, as they often fail in completely different contexts.

IV. Innovation tools for making cities smarter and more sustainable

16.   Technology, with its growing potential and falling costs, offers new opportunities for managing cities more effectively and for delivering better quality of life and better economic performance in a sustainable way. Cities have a broad range of applications at their disposal that they can tailor to support initiatives such as smart buildings, smart water management, intelligent transport systems, and new efficiencies in energy consumption and waste management.

17.   At the same time, technology is a tool, not an end in itself, and its effects will depend not only on which technologies are deployed, but also, and perhaps even more so, on whether decisions on technology are centred on human needs and whether technologies create platforms that empower citizens and businesses to work with city governments to create more sustainable smarter cities.

18.   One of the key potential benefits of stakeholder engagement is in tackling societal challenges such as climate change. Introducing individual technological innovation one at a time simply will not be enough for the scale and speed of change required. Different levers of change need to be acted upon simultaneously to bring about systemic and behavioural change. According to EIT Climate-KIC, the smart and sustainable development solutions that

have the most lasting impact are those in which the local stakeholders have been involved, empowered and given a sense of ownership in the process.

19.   In addition to technological innovation itself, embedding this kind of stakeholder engagement in the transition to smart sustainable cities also requires experimentation and innovation in policy design and governance at the city level.

20.   The city of Barcelona, a well-known smart city pioneer, is now aiming to be an "open, inclusive, circular and democratic city", where citizens are at the centre, and technological solutions are developed in an open, transparent collaboration between government, business, academia and citizens ("quadruple helix") to address societal challenges. Barcelona's iLab also promotes a culture of innovation and experimentation inside the city administration.

21.   One governance challenge when engaging stakeholders in policy-making stems from the fact that stakeholder groups pursuing narrow special interests often face particularly strong incentives and are willing to commit significant resources to engage with city authorities. To ensure that stakeholder engagement advances the public interest broadly construed, the process needs to be governed in a way that prevents narrow special interests from exerting undue influence.

22.   Innovative governance mechanisms that strike the right balance between competing stakeholder interests should be complemented by capacity building programmes for city officials and civil servants in stakeholder engagement.

23.   Digital technologies and connectivity raise concerns about how to handle and regulate what many consider the most valuable asset of the future: data. There is still little clarity on how data should be regulated, traded, valued, anonymised, and protected – ensuring that we can extract value while protecting privacy, ensuring property rights, and maintaining healthy competition. Smart regulation has a key role to play in protecting citizen rights and competition, while also enabling rather than blocking experimentation and innovation. As is the case with all areas involving such substantial risks and trade-offs, stakeholder engagement, testing of different options, and monitoring and evaluation of the results are essential to get the balance right.

24.   While regulation in these and other relevant fields is mostly not set at the municipal but at the national level, cities can sometimes serve as laboratories for testing different regulatory approaches and their effects. Three approaches to regulation were mentioned in this regard: advisory (i.e. advising on how to apply existing regulations), adaption (changing regulations based on feedback from innovators), and anticipatory (actively identifying future regulatory requirements through horizon scanning exercises, including at municipal level).

25.   So-called "innovation testbeds" can be used to test whether existing regulations are fit for purpose in a changing technological environment. More generally, innovation testbeds are agile policy innovations that can be used for a variety of experiments, ranging from testing whether a particular technology works as expected over different partnership arrangements to testing innovative solutions to societal challenges. Testbeds integrate different policy tools to support innovation and create a flexible environment for testing and evaluation. They are most commonly used as a local experimentation development mechanism but can also be included in national strategies given their potential for improving the efficiency and design of policy making.

26.   An essential issue in this context is diffusion. The topic of smaller cities and rural communities in the context of smart and sustainable cities was also addressed. On the one hand, larger cities enjoy agglomeration benefits, such as a higher concentration of people, resources, institutions and infrastructure, which facilitate the development of smart sustainable solutions. Often, such solutions do not scale easily, i.e. they are often not adopted broadly by other, particularly smaller cities and rural communities. This carries the risk of widening gaps in quality of life and economic performance between large cities and the rest. Several examples were given of open inter-operability standards that have been developed to support the scaling of smart city solutions.

27.   On the other hand, cities also generate agglomeration costs such as pollution, emissions, or congestion that can make adjacent smaller communities more attractive. Smart

digital technologies can create new patterns of mobility and of living and working between larger urban centres and their hinterland.

28.   There was broad agreement that small cities and even villages do have the potential to become smart and sustainable, and that in the long-term, large cities can only thrive if they are well-connected to a thriving hinterland. Smart city strategies at the municipal level therefore should be complemented by regional development strategies that support the hinterland.

29.   Public procurement, which can make up as much as a fifth of aggregate demand in the economy, is by far the most important lever to boost innovation in sustainability, with the public sector progressively becoming a key factor in investing into new technologies. Public procurement can not only promote investment into new technologies, but provide the right platforms – such as those that can match a potentially enormous amount of supply and demand, ranging from car-pooling to sharing of power tools that people now have to buy and may only use once. However, only part of the investment required for innovation can be mobilised through city budgets. In this regard, city governments cannot innovate alone but need to engage in partnerships with business and citizens (PPPPs or People First Public-Private Partnerships).

V.   Smart sustainable city key performance indicators (KPIs) and monitoring transformation

30.   An OECD study found that only "16% of cities with formal innovation goals conduct a comprehensive and systematic evaluation of the impacts of their innovation strategy".[3] This highlights that while many cities claim to be "smart and sustainable" and invest in this spirit, many do not have the structures in place to evaluate their progress to find out what works, what has to be modified, and what should be discontinued.

31.   An important part of experimentation and testing various initiatives is being able to know if they are working – including to identify and evaluate outcomes, and if possible, positive and negative impacts on people, places and the environment. In this respect, key performance indicators (KPIs) and monitoring, ideally agreed with and made available to a large group of stakeholders, are useful in setting measurable targets, identifying impacts and evaluating an initiative's success.

32.   Standardized KPIs are also a useful tool for cities to self-assess where they currently stand on various metrics of smartness and sustainability as a basis for identifying needs and gaps. They allow cities to measure the smartness and sustainability in a comparable way, using consistent and standardized methods of collecting data, while doing justice to the fact that solutions need to be adapted to local contexts. KPIs should allow cities to measure not only the extent to which they are becoming smarter, but more importantly, what impact smartness has on quality of life, economic growth and environmental sustainability.

33.   Communicating the results of the assessments clearly to citizens, and administrators and other stakeholders remains challenging. There are several ways to adapt standardized measurement frameworks to the specificities, needs and priorities of cities and their residents. One is to provide a set of core indicators relevant for most cities, and a separate set of additional indicators that are mostly relevant for cities in more advanced countries or for specific priority areas. Another is to use an initial assessment on the basis of standardized KPIs as an input for creating detailed city profiles which provide the necessary local context and derive recommendations and concrete innovation projects to induce positive change.

34.   Regarding the challenge of measuring the impact of greater smartness on quality of life and other goals, certain correlations have been established, e.g. between good city

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[3] OECD 2019, Enhancing Innovation Capacity in City Government:
https://www.oecd.org/publications/enhancing-innovation-capacity-in-city-government-f10c96e5-en.htm

infrastructure and good city governance on the one hand, and innovation and quality of life or economic growth on the other, but establishing causality has remained difficult.

35.   There are several tools and methodologies that cities can use to monitor and measure their progress. The United for Smart and Sustainable Cities (U4SSC) is a global platform with practical tools that support cities in leveraging digital technologies to become smarter and more sustainable. One of these tools is the KPIs for smart sustainable cities, which allows city planners to analyze the ways in which ICTs have improved the economic, environmental, and social and cultural aspects of their cities according to the parameters set in the 2030 Agenda. Another tool is the 2ThinkNow Innovation Cities Index which covers over 500 cities and contains over 162 indicators, relating to innovation, smartness and human factors.

36.   The city of Pully was one of the first to apply the U4SSC KPIs. Its experience highlights that smaller cities can also lead the transition towards becoming smart and sustainable. The U4SSC initiative has allowed the city of Pully to work together with other cities of a similar size and character, to learn from and help each other reach their goals. In addition to Pully, over 100 cities have already partnered with the U4SSC in implementation these indicators, such as Dubai, Singapore, Moscow, Riyadh, and Valencia. From 2019 to 2023 evaluations of 17 Norwegian cities, Nursultan (Kazakhstan), Grodno (Belarus), Bishkek (Kyrgyzstan), Tbilisi (Georgia), Tirana (Albania), Podgorica (Montenegro), and Almaty (Kazakhstan) are planned. The KPI evaluations will support these cities in establishing and meeting sustainable and smart city goals, and ultimately in the realization of the 2030 Agenda for Sustainable Development.

VI.   Key recommendations and conclusions

37.   The discussion highlighted a range of examples and different approaches that cities across the ECE region are taking to become "smart" and "sustainable". Among the issues discussed were

(a)   Cities account for large shares of economic activity, innovation, energy consumption and environmental impacts throughout the ECE region.

(b)   Urbanisation rates are projected to increase further. What happens in cities will therefore be critical for achieving sustainable development in the ECE region by 2030.

(c)   Achieving sustainable development requires innovation, at scale. Leading cities are dense in the key ingredients needed for innovation eco-systems to thrive, including, talent, finance, markets and strong connections between them. Leading cities can therefore serve as test beds to experiment with innovations for sustainable development that can then be replicated elsewhere.

(d)   Investment in technology, particularly ICTs, is driving the transition. ICTs can make whole cities "smarter" by generating inter-linked data on how city services and infrastructure are being used and by exploiting this data to create new and better services and use infrastructure more efficiently, thereby driving economic competitiveness while improving the quality of urban life.

(e)   However, investment in technology alone is not enough. They will have a truly transformative effect only if they help to create platforms where city administrations can work together with all stakeholders to co-create innovative tailored solutions that make cities more competitive and more liveable, for all citizens.

(f)   It is important in this regard to ensure that ICTs do not become a barrier to participation for certain potentially disadvantaged groups, including women, senior citizens, or lower income groups. At the same time, it is important to ensure that narrow special interests do not exert undue influence on policy priorities and technological solutions.

(g)   Beyond investment in technology, leading cities are therefore also experimenting and innovating on policy design and governance to make full stakeholder engagement a reality while appropriately balancing competing interests.

(h)   Businesses look for market opportunities when deciding on investments in innovation. Cities can encourage these investments in several ways, such as by providing the infrastructure and mechanisms to explore and test new opportunities, and by using their – often considerable – public procurement budgets to create demand for innovative and sustainable, rather than cheap products and services.

(i)   Many cities aspire to be smart and sustainable, but they often lack the information to make evidence-based decisions on the impact of their initiatives. Key performance indicators (KPIs) have been developed, including by the United for Smart and Sustainable Cities platform, to provide a transparent, verifiable and comparable framework through which cities can measure and monitor their own progress and through which they can learn from the policy experiments and technological innovations of others.

(j)   Central Governments play an important enabling role for smart sustainable cities by creating supportive regulatory frameworks in areas such as data protection and privacy, competition, and finance, and by facilitating the scaling up of innovative solutions that have been proven successful in individual cities. Cities can serve as testbeds to experiment with different forms of regulation as well, enabling governments to try out different solutions to see what works best before scaling them up.