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SMART CITIES

The sustainable program
of six leading cities

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CHAPTER 8

PERSPECTIVES AND WAYS FORWARD

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Perspectives and ways forward

City executives should be aware of the difficulty of rising to challenges such as fighting global warming and reducing carbon footprints. Most of them should know their priorities: developing and sharing a vision for the future, implementing both sustainability initiatives and policies, and verifying that all stakeholders are both aware of challenges and well involved in both decision and processes. Among these priorities, smart, sustainable, and inclusive cities are already enabling the goal of attracting investment from private financing actors and public investors around the world (Eden Strategy Institute, 2018). Innovative solutions are not limited to digital technologies. They also cover energy-saving solutions, public transportation, soft mobility, and new services. These new systems and the businesses that operate them can make city operations work better as well as consume fewer resources. For some analysts, "Smart technologies can help cities meet these challenges... It all starts with data."¹ We definitively do not share this exclusively technology-based approach to urban transformation.

Based on our thorough analysis of six smart cities, we have shown that urban transformation requires the convergence of three factors:

- A vision developed by the team in charge of running the city;
- Strong involvement of companies in delivering solutions and sharing value;
- Active collaboration involving different stakeholders.

In the short term, we anticipate that new infrastructure systems and new services will alter urban life in increasingly profound and personal ways. Our assessment indicates that some trends are already being addressed while others are not; this is why the vision of city teams, private companies' involvement, and citizens' participation are all crucial.

City governments have to find the right combination of vision, public policies, investment, technologies, and partnerships. Complementing those elements, the quality of governance, the way in which different ecosystems are managed, and the involvement of stakeholders in decision-making processes will allow cities to set their own starting points and identify their residents' priorities.

We have observed that some cities are already enabling new forms of public and public-private investment as well as innovations. To tackle climate and environmental emergencies, cities have to leave ample room for the private sector. It can contribute in three

ways: financing infrastructure, operating systems, and developing innovation. Moreover, based on their vision and engagement, city governments will do their best to identify short- and long-term priorities. However, they face certain conflicts. For example, scaling back funding for public operations in order to reduce deficits means not being able to finance urban transformation, while reducing investments in improving operating systems will limit scope for modernization. They should also consider offering innovative entrepreneurs the chance to fill in some of the gaps, mostly in the area of services (for example, digital platforms, mobility as a service, and energy grids).

Indeed, cities are the right location for innovation, and they have proved to be hotbeds for it. When it comes to developing new services in particular, there is plenty of room for both established organizations and newcomers to add something to the real-life experiment that is the smart and sustainable city. In the context of cities, the all-important quality of resilience is all about ceaseless self-reinvention over time, the goal being to innovate in order to rise to Grand Challenges such as reducing carbon footprints, saving resources (including land, water, and biodiversity), lowering energy consumption, and safeguarding residents' health and well-being. New activities, businesses, and solutions will help cities to accelerate the pace of these essential changes. More generally, offering a better quality of life in cities for as many people as possible will be the way to evaluate whether urban transformation is adequately contributing to the common good.

This last chapter contains three parts. First, we deliver a short comparative assessment of the six cities that we examined. Second, we discuss the main challenges for cities that we identified when we looked beyond our sample of six cities by reading interviews, attending workshops and conferences, and conducting further reading. Finally, we offer a couple of recommendations to the three most important players within any urban ecosystem: city governments, companies, and civil society.

No two cities are alike

National-level policy makers can create policies that drive the redesign of our economic and social systems and have public health and economic prosperity as their primary goals. Some take the view that "city governments cannot address the challenges of reducing emissions alone" (WEF, 2021). Under this interpretation, the future of cities would

[1] McKinsey Global Institute (MGI) (2018). *Smart Cities: Digital Solutions for a More Livable Future*. June. 152 p.

depend substantially on decisions made by national levels of government or by supranational institutions. However, as we mentioned in Chapter 1, there was a collective awakening among many city leaders after the failure of conferences such as the UN Climate Change Conference held in Copenhagen in 2009. Provincial cities, small regions, and large cities are now showing what can be achieved when city leaders truly set their minds to bringing about change. Cities are emerging as a key part of the general effort to reduce carbon emissions and change how the climate-warming drama unfolds.

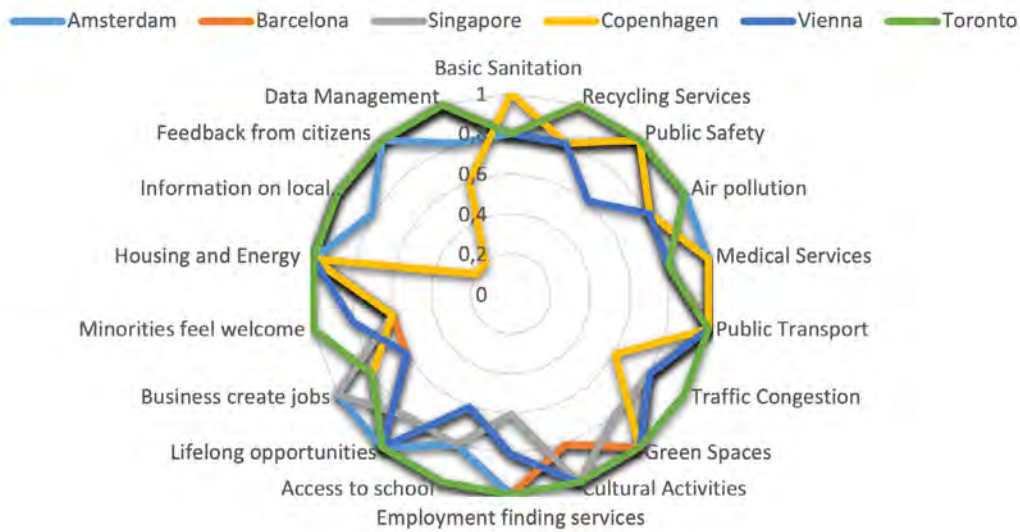
Among the six cities studied in this ebook, Singapore is organized in a dualistic way; it is both a city and a national state. Capitalizing on the confusion between these two statuses, the city is billing itself as a Smart Nation as it seeks to become recognized as a top global metropolis. A few years ago, the Singaporean prime minister elaborated Singapore’s vision for the future and established an entire government department to

pursue its Smart Nation initiative, thus merging the two levels of governance. Doing so has helped Singapore to coordinate interagency efforts.

However, there are extremely few jurisdictions like Singapore elsewhere in the world. Moreover, many city consortia or groups and some prominent mayors express a different outlook to that proposed by Singapore’s model: they claim that the world’s large cities can solve climate and environmental crises using their own governance machinery (Miller, 2020). In our view, sometimes the institutional environment at the state level is enough, and sometimes interactions between the city and state levels are required to bring about change. Ultimately, the quality of any relationship between the two levels is the crucial factor.

In this section, we will pick out some of the eighteen dimensions that we used to compare our six cities. All eighteen dimensions are shown in the Figure 8.1 below.

Figure 8.1 Comparison of six cities over 18 dimensions



A- Vision and governance

All of our six cities are high-income cities that have well-developed urban policies and among the world’s most advanced digital-, energy-, and mobility-technology infrastructure. When they began their journeys of urban transformation, these six cities had intrinsic advantages, including wealth (both in terms of geographical area and people), density (with regards to population and buildings), and innovative and high-tech industries.

Nevertheless, we believe that cities and metropolises that lack

these advantageous factors can still set themselves apart and develop their own efficient policies. Examples of places that have done so include Curitiba in Brazil, Kigali in Rwanda, and Medellín in Colombia. To rise to this challenge, however, they must have a clear vision, undertake sound urban management, and act based on a willingness to break away from the dominant and traditional ways of doing things. Above all, cities’ management teams have to demonstrate their relentless commitment to understanding and meeting the needs of the people whom they serve.

Within our sample of six cities, Singapore has set the clearest goals for implementing initiatives. Here, the national priority is to make the business environment attractive for international investors by developing the world's fastest and most extensive digital infrastructure. Singapore has also prioritized offering a wide range of government services digitally to make them faster, more convenient, and more accessible for citizens. Singaporeans can now use mobile applications for almost everything, from accessing health records to paying for parking and reporting emergencies.

B- Innovation and partnerships

Of our six cities, those which have the most advanced technological bases are Singapore, Barcelona, Amsterdam, and Toronto. Amsterdam Smart City is a public-private partnership (PPP) that brings together municipal departments, educational organizations, nonprofit organizations, private sector companies, and, of course, startups. Amsterdam views itself as an innovation hub that plays host to many actors that are launching projects focused on broad and weighty issues such as renewable energy sources, smart energy, soft mobility, and accessible livability. Amsterdam has also taken an active role in developing talent by establishing the Amsterdam Institute for Advanced Metropolitan Solutions through a collaboration with private sector partners.

Barcelona, meanwhile, is using public funding to renovate older industrial sites via initiatives such as @22Barcelona. This is an incubator for startups to develop new services, apps, and tools. The initiative has attracted private investment from Cisco, which has set up the Barcelona Co-Innovation Center there.² Among tech companies, Cisco has made early moves in promoting the idea of turning cities into smart cities, developing platforms and digital solutions that have since been implemented in, for example, some US cities as well as in Songdo (South Korea).

Toronto had set up a public-private partnership with Sidewalk Labs (an Alphabet subsidiary) to turn a large part of the city's waterfront into a very modern and up-to-date community. The project was Alphabet's venture into real estate, and it was envisioned as a testing ground for new technologies. Unfortunately, the project failed in spring 2020.

Overall, successful companies appear to have an intimate and deep understanding of the cities with which they want to collaborate, and they see those cities as a place where they can showcase how their solutions will transform people's lives. It is significant and noteworthy that all six of our cities'

governments have felt a need to call on civic tech talent and private companies' expertise within a couple of specialized areas of urban development.

C- Innovation and citizens' participation


Barcelona has innovated in this area by creating Decidim. Barcelona, a digital platform that offers residents ways to participate in the public decision-making process, including a tool to make proposals, join discussion groups, and receive follow-up communications after they have expressed concerns. Barcelona's city government is also increasing citizen participation by inviting residents to notify it of any irregular and inappropriate aspects of municipal contracts, which are published online.

Barcelona's transition to becoming a smart city has significant momentum. The Catalan digital technological base is strong, boasting a remarkable open-data portal, a network of good air quality sensors, and extensive public Wi-Fi coverage. Moreover, if we compare mobility and security, mobility applications have been more strongly embraced by the public than have security apps that, for example, let members of the public report crimes or see on a map where crimes have occurred. People are mostly aware of the mobility apps deployed to facilitate multimodal transport habits; usage of them is growing and satisfaction with them is still high. Barcelona is known as one of the leading smart cities in Europe, competing with Amsterdam and Copenhagen.

More recently, around 2018, Barcelona's city government amended its data policy in order to deliver a more effective use of public data, dashboards, and platforms. The revised policy aims to make privacy, data sovereignty, and data security the city's three top data-related priorities. The amended policy also created an open-data platform, the Open Data BCN portal, whose data is accessible to every citizen. The city has therefore shifted from a locked-data policy to an open-data one. To do so, the city now retains control of platforms, and it aims to harmonize rules and break down data silos. The city is also incentivizing startups to use public data to launch new services.

In Toronto, Sidewalk Labs held various community events, including residents' meetings, local pop-ups, and public workshops. Until Sidewalk Labs stopped its project, the firm used hackathons to crowdsource innovations, and it even used new tools such as modeling and visualization instruments to offer 3D previews of the finished project and to communicate the design choices that were being considered. However, this participative approach was ultimately not enough to create consensus.

(2) https://www.cisco.com/c/m/es_es/innovationcenter/barcelona-en.html [Accessed on 21 April 2021].



When it comes to citizen participation, Copenhagen remains the paradox of our study. It is extremely clear that local democracy is well developed in Danish cities. However, publications, documents, and other materials posted publicly on the City Council's platforms do not emphasize citizen participation as a priority. We suppose that, once citizen participation has become an intrinsic part of local democratic processes, there is little benefit in emphasizing its existence. Indeed, cities that emphasize it as a priority may be the ones that have the most to do to make it a reality.

Overall, according to their means and objectives, citizens and communities can make thoughtful choices about the ways in which they live and what they consume. The hidden difficulty involved in citizen participation concerns the extent to which citizens are aligned with sustainable, climate-friendly values. City executives are aiming to persuade a large proportion of citizens to engage in new forms of participation. However, there is no guarantee that citizens will do so. A potential divorce can arise between long-term visions and citizens' daily actions. A sustainable policy at the city level requires a change in citizens' behaviors concerning, for example, the energy services they use, mobility options, and the adoption of new technologies. Some citizens may support the energy transition, but others may resist it.

Generally, citizens should be involved in shaping the future of their cities. Even if a city reforms its democratic processes, putting people at the center of every decision does not make for an easy way of doing things. Municipal policies favoring civic participation require the stage at which the city expects to consult people to be defined. Citizens need to know whether they will be involved from the beginning—that is, at the project-design phase—or will be consulted over an already well-defined project. Will citizen participation be the same whatever the projects, independently of their specificity or complexity? Starting a consultation from the design phase can ensure that the local community buys into a project.

Finally, each of our six smart cities has the potential to create a new type of urban commons that is based on a shared pool of digital resources and services. Many city departments maintain an active involvement in social networks. This habit would enhance social connectedness, even if the community size were hard to quantify. Platforms, apps, and new ways for the public to communicate with local officials all have the potential to make city governments more open minded and responsive.

D- City labs and experiments

Some smart cities, such as Copenhagen, are meeting the

challenge of citizen participation by testing and improving new applications and services in pilot districts that serve as real-life laboratories. Social experimentation is a key instrument for collecting feedback from potential users. For example, Copenhagen has innovated by developing an experimental approach to its open-data portal.

Copenhagen has also well-known incubators such as the Copenhagen Solutions Lab and Energylab Nordhavn. They fully focus on accelerating urban initiatives and engaging with either public or private partners. Moreover, Copenhagen's City Data Exchange, developed in partnership with Hitachi, makes it possible for companies and inhabitants to upload additional data to publicly accessible datasets. The City Data Exchange also serves as a marketplace that has enabled the city to develop paid services and to monetize new apps. For example, users can subscribe to databases and then make use of them to develop innovative new services focused on the city.


In Vienna, some pilot applications for utilities are tested in living-lab areas before they are scaled up. Overall, such municipal initiatives incubate many experiments with a view to turning some over to the private sector and developing a market based on services for which users are charged a fee.

E- Carbon-neutral cities

Copenhagen has set the clear and ambitious goal of becoming the world's first carbon-free capital by 2025. The city is the owner of large-scale energy generation systems. It has also developed high-speed broadband networks and mobile coverage. Investment in ICT has supported the City Data Exchange by allowing the parallel growth of energy grids and smart energy meters. The insights yielded from data have informed ideas about how the energy grid should be adapted or expanded to make the overall system perform better. For example, it is recognized that large-scale heat pumps operate better when connected to the distribution network. To fully achieve its carbon neutrality goal by 2025, Copenhagen must optimize both production and distribution of energy. Grids will play a great role in this area. The city's energy-saving efforts focus on complementary areas such as the link between utilities and mobility. The aim is for this technological infrastructure to play a role in other domains such as healthcare services.

F- Energy savings and buildings

Singapore is aiming to scale up the role that smart technologies play in its buildings. In 2019, the Building and Construction Authority (BCA) established a portal for monitoring energy use



across a portfolio of thirty buildings. The BCA is using both data mining and machine learning to send messages to facility managers to take corrective action against behaviors that waste energy.

Aspern Smart City in Vienna is one of Europe's largest energy efficiency projects. Through the collaboration of several municipal organizations, the local utility company, various research institutions, and industry actors, the initiative is pioneering forward-thinking energy-focused service and technical solutions that are being tested in a real-life urban environment by real end users.

Furthermore, within the Aspern Smart City project, various ICT and energy companies are involved in developing and testing innovations over large-scale areas. For example, the German company Siemens, one of the biggest investors in the Aspern Smart City Research project, has taken on technological leadership in partnership with the local utility provider.

G- Mobility and greenhouse gas emissions

Some energy-saving and soft mobility programs can contribute to reducing greenhouse gas emissions and improving air quality. Some cities' efforts to reduce GHGs are hampered by the fact that physical and geographical structures are their major source of emissions.

In 1975, Singapore pioneered a congestion-pricing scheme and then reinforced it through vehicle quotas and tax policy. Under this initiative, known as the Area Licensing Scheme, a fee³ was charged on vehicles accessing the central business district (CBD) during peak morning hours. As an alternative, drivers could park outside downtown and take transit into the CBD.

This program had immediate effects. Public transit ridership accounted for 33 percent of all journeys taken in 1975; it accounted for 70 percent of them in 1983. In the 1990s, the program was replaced with a dynamic electronic road-pricing system that included off-peak hours. The new system further improved public transit ridership and reduced traffic volume. As for the future, Singapore has put together a research and development consortium of partners for projects that will speed up the rollout of fully electric and autonomous cars and buses. Singapore has set a demanding time line for introducing fully autonomous electric buses and launching a program of on-demand shuttles into the city. These two decisions are important aspects of a larger mobility plan that will be completed in 2022.

[3] At that time: three dollars per day and sixty dollars per month.

The abandoned Sidewalk Labs project in Toronto called for autonomous cars and mixed-use neighborhoods with open spaces, as well as for other mobility options such as pedestrianized areas and soft mobility equipment. The remaining condition was to deliver affordable housing that would attract people to settle in the area.


Copenhagen's mobility solutions rely much more on soft mobility and intermodal connections. Other cities have developed their own mobile apps for accessing information, but Copenhagen is the only one to place such strong emphasis on intermodality. All six cities remain committed to innovation in mobility.

Finally, cities have a role to play in both encouraging adoption of new transport behaviors and setting regulations that make day-to-day commuting faster, easier, and less frustrating for people. When it comes to transport, the right scale is determined primarily at the metropolis level rather than at the city level. However, cities make better decisions about more specific matters such as redesigning bus routes, rearranging traffic signals and turn lanes, developing bike lanes, and, finally, setting infrastructure budgets. One additional key idea is to reduce the dominance of fossil fuel vehicles on public roads.

Investing in public transit and seamless multimodal connections is crucial. Business models and pricing should evolve as urban transit systems are developed in such a way that ticketless and digital payment systems can be introduced. Some cities are going a step further by offering attractive rates on passes that grant access to multiple modes of transportation and so encourage a successful intermodal combination of bikes, trams, and subways of the kind found in Copenhagen. The key challenge is to reduce traffic congestion on working days. Policies that set this goal seem to be more effective in towns where ground transportation, buses, and cycling are already the primary modes of transit. Areas where cars are still dominant—suburbs, for example—need to be connected to the public transport network, and greater regulation of traffic via measures like peak-hour payments and access permits is required. To complement these policies, encouraging car sharing requires dedicated lanes.

H- Healthcare

Singapore is expanding the use of applications that cater to its older population groups. Applications that deliver services such as remote day-to-day patient monitoring, telemedicine checkups, virtual rehabilitation sessions, and video



consultations are providing help to seniors in their homes. Smart technologies are also being used in Singapore to help people with disabilities and the elderly to navigate the city. Under Singapore's Green Man+ initiative, elderly people and individuals with disabilities are issued with a special card that, when it is tapped on a reader installed at a pedestrian crossing, extends the length of the green light to give them extra time to cross the road.

Vienna has developed an alternative approach to accommodating the needs of its elderly population. The Austrian capital is a leader in the introduction of healthcare applications. The city offers a mobile service that connects patients to the nearest physician, care center, or pharmacy. In addition, the city offers tools for end users and homecare nurses to check and monitor patients' vital signs. To our knowledge, health policy is an integral part of the strategy in Vienna. Universities, pharmaceutical companies, and startups have collaborated in a public-private partnership, Health Hub Vienna, to set up an effective and efficient ehealth ecosystem.

I- Security

Extensive networks of cameras to monitor streets for suspicious behavior have already been installed in many of the cities in our sample. Singapore seems to be more active than the other five cities in this area. Supervision systems require both decentralized equipment such as sensors and monitoring equipment and a centralized [hypervision](#). In addition, some private security systems are connected to the public monitoring system. Among the six cities we analyzed, all have high-speed fiber optic networks, and they are deploying 5G services.

J- Quality of life

As we mentioned in the Executive Summary, different quality-of-life dimensions exist. People living in urban areas are paying more and more attention to security. However, having time for shopping and convenient, smooth commutes are still cited as attributes that shape quality of life. In addition, people are paying more attention to health conditions and environmental quality. Their subjective expectations are a mix of different items that includes pollution levels, social connectedness, civic participation, social life, and job creation. Nevertheless, the cost of living is still at the top of people's assessments concerning quality of life. Our study shows that city governments need to play a role in this area. Labs and experiments are one way in which they can do so, and pilot initiatives followed by large-scale rollouts must be feasible, especially in the period following the COVID-19 pandemic.

As ecosystems, cities can be catalysts for better health and lifestyles. City governments must act if they are to address such a complex challenge as ensuring a good quality of life. Sustainable cities are intended to deliver a more sustainable environment for improving the way of life of their inhabitants.

K- Some limitations

The approach to smart cities that we have taken in this ebook has some limitations. First, we have not covered cities in developing countries, where cities' stakeholders face extra challenges—for example, a lack of infrastructure, weak technological bases, slums, poverty, and resource depletion. Second, we may have underestimated concerns about privacy (that is, protection of personal information) and cybersecurity risks. Third, many of the world's cities, including the six that we focused on, are experiencing serious housing shortages, increasing rents and home prices, and escalating tensions within rental markets. Many inhabitants of the six cities are concerned that the place that they call home will become an inaccessible hub of gentrification or, in the case of Barcelona, will be overwhelmed by mass tourism. Fourth, cities with chronic water shortages, such as Barcelona, have already deployed solutions. More generally, in some cities, water conservation programs (for example, water consumption tracking), solid waste reduction (for example, low-tech recycling programs), and a circular economy have been developed to anticipate such resource shortages (water, power).

Urban transformation and tomorrow's lifestyles

The second part of this chapter is about the challenges of urban living today and tomorrow. It shows that new information, communication, and energy technologies create opportunities to help cities to save on resources. However, these technologies are nothing more than tools for implementing proactive urban planning that aims to reduce pollution, greenhouse gas emissions, and social costs (for example, rates of death, disease, unemployment, and health problems). A city's status as a smart city supposes that the city prioritizes reducing its carbon footprint and implementing sustainable urban policy.

The process of turning a city into a smart city happens slowly. A number of factors are critical to increasing that process's momentum. Accelerating implementation requires close collaboration between key stakeholders. Across a range of issues, urban transformation brings together a large number of stakeholders, including private companies, associations, NGOs, residents, and, of course, the people in charge of managing the

city as well as the administrative personnel connected to them. Building a culture of initiative, innovation, and collaboration is key.

Consequently, the debates and policy choices connected to the smart and sustainable city are embedded in a multidimensional environment. The implementation of any type of urban policy and planning requires the development of a vision of the future of a smart city. This vision must be developed with the involvement of a wide range of stakeholders—including the local community. Foresight, participation, and agreement on priorities could be the factors that determine the success of efforts to build a vision of the future for cities and businesses.



jc-gellidon-Khqmo4T-rs0-unsplash

A number of factors will drive success when it comes to the implementation of sustainable city policies. In an urbanized world, public and private interventions are essential for giving citizens the living experience they need and want. Moreover, innovative technology and funds are required to innovate and deliver the city of the future. Above all, the residents of a city are its greatest asset. Involving them in transformation efforts will be key to the success of municipal initiatives. As the former mayor of Rio de Janeiro, Eduardo Paes, once said, “Favelas are not always a problem. Favelas can sometimes really be a solution.” We will now put forward some perspectives on the key choices that smart city stakeholders have to make. We have framed these perspectives using the two extremes of the spectrum of choices that cities have in each area so that readers have a better understanding of the full range of options that must be considered and of the tensions that exist between those options.

Developing Established Cities vs. Creating Utopian Cities. Existing cities raise a couple of major challenges because land has

already been occupied, and infrastructure and settlements have already been built. As a result, path dependency influences city planning in established cities, and urban transformation takes time. By contrast, projects to build a new city from scratch aim to create a perfect city in which everyone works in harmony with each other and is happy. It is a utopian vision of the city.

Renovation vs. Greenfield. Most urban transformation projects and processes involve existing cities. Greenfield cities supply the opportunity to analyze the benefits and drawbacks of certain elements of public policy, under conditions similar to those of a city lab. Existing cities shed light on the ranking of priorities set by city executives: buildings, motor vehicle traffic, and resources.

Being Green vs. Being Smart. Sustainability causes public decision making to focus on two dimensions: greening and bringing in appropriate “smart” solutions. To be successful, urban policy must rely on interaction and complementarity between the two objectives.

Human vs. Technology. Citizen participation, not reliance on ICT, has become a key determinant of the social acceptance of both regenerative and new projects. Moreover, the involvement of people in sharing data can lead to the development of innovative solutions and use of apps generated by end users. The use of citizens’ data has to be governed by protection of privacy and, potentially, trust. Consequently, a culture of innovation to develop new functions and services, as well as collaboration with citizens and external entities, will be key. Data-sharing services are also required to enhance both fluidity of mobility and energy efficiency. Social acceptance can be assessed against two criteria: whether citizens are likely to use a specific solution, and whether inhabitants are willing to pay more for the solution.

Governance-Based Approach vs. Ecosystem-Based Approach. Two main levels of governance can be identified in the area of urban issues. The first is that of municipal councils, which are generally elected by universal suffrage and are in charge of the management of the city. This layer of governance relies on an administration to give practical effect to its projects. A second level of governance organizes the contractual relationships between the municipal entity and all its service providers, whether they are under direct management (régie) or delegated. Finally, with a more flexible and horizontal organizational structure, collaborations nourish an interlacing of projects with specific and dedicated governance, and they bring together organizations with various legal statuses. These forms of collaboration between various organizations are similar to an ecosystem.

First, an ecosystem is a complex network or an interconnected system. Second, a business ecosystem pools many organizations and stakeholders. Third, ecosystem members generally interact on the basis of competition and/or cooperation, depending on the matter at hand. Fourth, each entity belonging to a city's ecosystem influences and is affected by the others. Fifth, an ecosystem creates a constant changing of ties and relationships among members. Being much less formal than a governance-based approach, an ecosystem-based approach requires each entity to be flexible and adaptable.

Citizens' Participation vs. Centralized Decision Making. The current city experience faces social, environmental, and infrastructural challenges. City residents must deal with multiple challenges, from public security and transport issues to cultural issues and long-term concerns about sustainability. The promise of a sustainable future relies on a knowledgeable vision. Moreover, it is critical to put citizens at the center of smart and sustainable city initiatives. Success requires developing a deep understanding of the areas of life in which inhabitants are willing to adopt smart city innovations and change their behaviors. Urban transformation will alter some parts of the urban way of life. It will require a willingness from citizens to pay more to access smart solutions. The aim is to attract private investors.

Centralization vs. Decentralization. National and local cultures strongly influence decision-making practices, as does the ideological heritage of the team currently in public office. The methods and processes for organizing the flow and circulation of information, which may go from top to bottom or bottom to top, are strongly imbued with various core prerequisites. Among these, the type and level of participation of citizens, and of civil society, will be influenced (or not) in the long term. Among key determinants, we identify the level of decentralization of public decisions and the degree of involvement of people and organizations. In fact, the collaborative vs. authoritarian nature of exchanges between the different types of actors involved in major urban issues will be dramatically important: exit the collaboration or voice the concerns and claims.

Autocracy vs. Democracy. Three factors are extremely important to democratic institutions: vision, leadership, and entrepreneurship. First, mayors and their teams have to create a compelling smart city vision that has sustainability, resilience, and inclusiveness at its heart. For city officials, all initiatives deserve to be in coherence with their vision. This

vision must itself be delivered, shared, and tested to be as coherent as possible with local initiatives. Second, leadership is a prerequisite for starting smart city implementations and being successful in advanced stages of initiatives. Third, city officials need to feel empowered to act as entrepreneurs. Urban planning and smart city programs should focus on key use cases and an entrepreneurial spirit. Usually, citizens recognize the value of such smart city initiatives and are willing to adhere to a good number of urban services.

The common good requires all hands on deck

To make smart cities work, the key challenge is to pool initiatives and give coherence to projects. In this ebook, we have identified the smart city's stakeholders operating at different levels:


- City leadership and administration, as well as public sector employees;
- Private sector companies;
- Residents from all neighborhoods.

A- Great smart cities' challenges require good city governments

Throughout this ebook, we have seen how sustainable city policy depends on the set of natural, geographic, economic, and social aspects that condition all urban planning. However, another factor also determines sustainable city policy: good city management.⁴

When they began their bids to become smart cities, the six cities in our sample already enjoyed exogenous advantages—for example, wealth derived from economic performance, density (which indicates the attractiveness of a place for some people), and existing high-tech industries that were able to offer the city ICT, health, energy, and mobility solutions. To be sure, there are other cities in the world that lack some of these advantages. However, all cities and metropolises are capable of elaborating their own visions, exercising good management, and implementing urban planning policies. Successful policy also depends on a clear vision as to how to break away from the traditional ways in which cities have been managed. A good city government has to understand the needs of the city's residents and meet their expectations. To do so, it must redouble the efforts made by municipal agencies, educational institutions, nonprofits, private sector partners, and startups. This type of engagement has the potential to change how cities are governed.

[4] The Italian painter Ambrogio Lorenzetti (1290-1348) foreshadowed this concept in his painting *The Allegory of Good and Bad Government*, a set of three fresco panels painted between February 1338 and May 1339. These paintings are permanently located in Siena's Palazzo Pubblico. The three masterpieces are made of six different scenes: *Allegory of Good Government*, *Allegory of Bad Government*, *Effects of Bad Government in the City*, *Effects of Bad Government in the Country*, *Effects of Good Government in the City*, and *Effects of Good Government in the Country*. https://en.wikipedia.org/wiki/The_Allegory_of_Good_and_Bad_Government; <https://www.visittuscany.com/en/attractions/siena-ambrogio-lorenzetti-good-and-bad-government/> [Accessed on 20 April 2021].



One key challenge that good city government has to rise to is to change the nature of infrastructure so that the city has the ability to do more with less. Infrastructure needs to offer modularity, and it must be scalable as the city grows. There also has to be scope to easily replace, adapt, or upgrade infrastructure when underlying needs evolve or regulations change.

Urban planning ought to be combined with asset development to get the most out of the systems that are already operating via the existing infrastructure. Investment in infrastructure once locked many cities into capital-intensive and extremely long-term plans. For city executives, infrastructure entails uncertainty, and dealing with uncertainty requires them to anticipate how demand for a given service will evolve. One solution is to combine traditionally designed buildings with sustainable solutions in the right way. Cities might also become more dynamic in their attempts to understand shifts in demand for particular services and infrastructure, which can be detected by looking at changes in, for example, commuting times, energy consumption, and the types of transportation that residents use. They must openly embrace innovation and encourage private sector involvement. Today, city governments cannot attempt to be the sole financial backers of infrastructure projects, because the debt burden that doing so would place on them is too high. And they cannot be the operator of every type of service and infrastructure system, because new business models have made that approach inviable.

Most cities have to decide whether they mainly run operations on their own or sign partnerships with private companies: traditional public procurement or public-private collaboration and partnerships. The former relies on tax or public debt, the latter on financing from private companies. This phenomenon is an important change in procurement policy, contract terms, relationships with private operators, and vendor management in order to fit better with evolving solutions (for example, soft mobility, car sharing, mobility as a service [Maas], multimodal solutions), and inhabitants' needs.

In terms of financial capacity, personnel competences, and expertise, most cities have limited resources at their disposal. City governments can make use of innovative financial mechanisms (for example, social bonds) so that they do not have to be the only financial contributor to and/or operator of every type of service, utility, and infrastructure system. A larger share of sustainable investments should come from private actors or public-private collaboration.

Beyond accurately anticipating demand, some innovative solutions can involve and be shaped by residents (for example,

using transit at off-peak hours, changing commuting routes, and using much less energy and water). Such sustainable solutions rely on changes in end-user and citizen behaviors. Complementarily, solutions can already be identified—for example, using preventive self-care, accelerating the use of rooftop solar panels, and selling power back to the grid. Implementation of these things depends on both availability and incentives. Moreover, sharing personal vehicles for use in commuting, teleworking on a part-time basis, and/or relying on temporary rental solutions instead of on ownership can all help in developing sustainable solutions over time.

A good city government will put residents at the center of everything in order to design new policies and measures. The entire challenge is the ability to cope more effectively and dynamically with the needs, expectations, and desires of residents.

Overall, mayors and city administrators can lead sustainable urban transformation. One priority is to cut emissions, reduce pollution levels, and deliver added benefits in terms of job creation, health, and resilience. To do so, collaborative processes bringing in different stakeholders and urban planning will be crucial tools in the long term. Moreover, switching to innovative systems will mean moving away from traditional city planning, which is mostly premised on individual ownership of assets. New activities will cross the borders of specialized sectors (for example, the energy, housing, and automotive industries). All actors from the traditional sectors are invited to share professional expertise with startups, new-entrant companies, and even residents.

Mayors and city governments can engage multisectoral business, civil society, and stakeholders, including players from finance and investment, real estate, construction, utilities, urban planning, design, and engineering, to identify and execute combined solutions that address multiple issues.

B- Smart cities offer companies major market opportunities and an environment that encourages disruptive innovations

New business opportunities

The key uncertainty regarding the fomenting of new opportunities concerns their starting point. On one hand, smart cities can create new business opportunities because they invite incremental, radical, and disruptive innovations. Innovations will also help to reshape value chains; combine activities, skills, and businesses; and potentially force companies to adapt their offers to new social needs. On the other hand, if cities

can create a favorable environment, they cannot substitute private initiatives. Cities need to set up labs and launch social initiatives, but all of these should rely on private involvement and financing. Overall, quality of collaboration will influence the propensity to innovate.

Developing a sustainable city policy requires setting up new business models. These models could be launched by players from many different industries. Our study shows that the business opportunities generated by smart city initiatives will mainly be business-oriented services. We need to assess mechanisms to assist the innovation process for embedding sustainability in business models. Both city governments and companies have to define a clearer agenda for sustainable business models. One key element is for both investors and city executives to pay attention to the long-term horizon, to implement recycling activities to save resources, and to introduce a circular economic framework. The aims of a complementary work would be to identify, categorize, and explain business model innovations turned toward sustainability. Moreover, to be durable, new business models must rely on providing financial mechanisms to reduce risk. Finally, to improve their attractiveness (for example: What are the risks? Who bears the risks? How will investors be incentivized?), new business models must offer better transparency regarding their contribution to sustainable urban models and innovation processes.

New business models

Scholars have identified eight business model archetypes that align well with urban transformation objectives and complement our study of the six smart cities.⁵

The first model involves maximizing material and energy efficiency by, for example, reducing the use of resources. The second is the creation of value from “waste” through developing a circular economy (UN-Habitat, 2010). The third business model concerns switching from nonrenewable resources and energy sources to renewables, as well as nurturing natural resources with a view to, for instance, reducing artificialization of soils, expanding green areas, and capturing atmospheric heat in buildings designed according to passive design principles. The aim of the fourth model is to deliver functionality rather than ownership—that is, introducing car sharing, soft mobility, and sharing systems that mitigate the need for residents to buy their own vehicles. The fifth is governments’ adoption of a stewardship role, under which they tend to all aspects of their populations’ well-being. Citizens expect public decision making to focus on care, health, quality of urban life, and education

systems not only for the young but for adults at all stages of life (WHO, 2020). Every municipal decision must encourage sufficiency and resilience, and so doing more with less is the sixth model. The seventh is about repurposing business for society and the environment in a way that can help to contribute to the common good. Finally, developing scale-up solutions can help to expand and diffuse already tested business models. Enlarging social experiments will be key.


To set their strategies, companies across industries need to adapt their current offerings to satisfy smart cities’ needs and urban transformation. In multiple industries, companies have already begun to transform their existing products and develop new services to satisfy and contribute to changing urban markets. They are transforming their supply portfolios through combining existing vertical businesses. For example, utility companies are rolling out smart meters and encouraging new behaviors for saving resources. Others are introducing dynamic pricing models. Real-estate investors can integrate databases into their operations to improve both occupancy rates and revenues by optimizing their pricing based on supply and demand. Moreover, artificial intelligence and machine learning can be useful. For example, using them to process data on occupancy, pricing, renovations, censuses, and third-party real estate can help investors to accurately predict real-estate demand. In many cases, pulling together companies’ data and external data is very helpful. For instance, it is important to know whether some businesses have created headquarters or R&D centers in outlying areas; the opening of a new school, meanwhile, signals the need for family-friendly units. More and more real-estate investors are now including car-sharing systems or mobility options in their real-estate condominium models to better fit market trends.

Mobility and infrastructure

Infrastructure suppliers can use digital technologies to optimize how they operate physical assets and to reduce social costs such as diseases linked to pollution, work stoppages, traffic congestion, and time leakages. For smart cities, improving the efficiency, capacity, and expertise of infrastructure providers is essential. Information technologies can provide detailed real-time information on how assets are being used (for example, peak usage times, hourly energy consumption, car-slot use, occupation rates of houses and offices), and they can also mine that data to yield insights (CapGemini, 2020).

In addition, cities can use apps to ease pressures on public assets and infrastructure over time. First, information given to users offers them a deeper understanding of the different

(5) Bocken, N. M., Short, S. W., Rana, P., & Evans, S. (2014). A literature and practice review to develop sustainable business model archetypes. *Journal of Cleaner Production*, 65, 42-56.



ways in which infrastructure and assets are currently being used. Sharing information can help to change end-user behaviors. Second, to complement, cities or operators can also implement real-time dynamic pricing frameworks (tolls are higher for peak hours). In transport, new business models will rely on technological solutions providing both congestion-pricing models and better-integrated multimodal information (for example, seamless systems for different public and sharing transportation systems). Moreover, suitable real-time information fuels some dynamic pricing traffic systems. It helps to minimize overutilization of the physical networks. Consequently, information systems provide adaptive tools and help to reduce the need to construct new equipment.

Urban mobility is changing dramatically. Combatting climate warming in large cities is a key challenge. Among other tools and options, mobility has become an attractive field for investors, with diverse companies coming from different industries (for example, energy providers, carmakers, ground transport, cabin manufacturers, mobility platforms, ride-sharing services, and soft mobility solutions). All compete or collaborate for a total market in which total value is rapidly increasing.

C- Smart cities have many constituencies and stakeholders

Many smart and sustainable cities are similar to ecosystems of players drawn from a variety of existing industries. These stakeholders have different legal and social statuses (private, nonprofit, civic associations) and do not have the same objectives. A key idea is to look for productive roles for each in the city ecosystem to contribute to sustainable solutions (OECD, 2020).

Within such an ecosystem, city government may derive benefits from more intense citizen participation and obtain harmony between city decisions and citizen expectations. In parallel, most private companies have a high willingness to invest in urban transformation. Taking advantage of the ecosystem, companies develop a greater inclination and higher capacity to collaborate with other actors and help to launch startups and entrepreneurs. At the city level, cooperation can accelerate the provision of platforms and speed up the integration of different services into shared platforms and systems. Moreover, collaborating also improves the emergence of a new category of actors: the integrators in charge of the orchestration of different complementary activities. Such integrators are crossing the traditional borders between industries, and they give rise to a network of partners.

To be attractive, an ecosystem must not only be based on cooperation but also pay attention to technical compatibility across traditional industries. Indeed, an ecosystem relies on the ability to blur the traditional borders across sectors in order to stimulate innovation and new services. Some companies are completely changing their business models and adopting creative business and financing models. Some nonprofit organizations are promoting solutions. When companies, innovators, and startups introduce new devices, products, or services in an urban environment, they have to ask themselves how their offering could affect all of the stakeholders and actors there. It is also advisable for them to provide an assessment of potential negative externalities and side effects.

For city governments, launching new initiatives and projects means accepting the risk of social pushback. However, doing nothing exposes them to heavily critical opinions. The path between the two options is narrow. For example, even in a positive collaboration with city executives, if companies try to launch innovations and disruptive business models before dialoging with the local community in advance, they bear the risk of a potential legal backlash and lawsuits, social refusal, and/or community hostility. More generally, companies have been using their relationships with local governments to branch into partnerships that are focused on setting new business models and generalizing the implementation of smart solutions. However, because citizens are mostly valuable stakeholders, it is critical to engage them in the deliberative and decision processes. Communities can be vocal.

Across major urban areas, city government initiatives have to demonstrate their capacity to create value for the many. Cities across the world are facing scrutiny from many observers and organizations. Every local initiative could benefit multiple cities.

Overall, smart and sustainable city initiatives deliver value and earn loyalty. Working in a collaborative manner will create the common good.

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