

The IDC Smart & Sustainable City Index

Municipal Playbook





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The Evolution of the Smart City

The concept of a "smart digital city" has been intriguing researchers since 1993. However, in 2008, the year of the global financial crisis ("The Great Recession," second in severity only to the Great Depression of the 1930s in the USA) IBM decided to take the matter forward: To redirect their business model from a focus on hardware to a focus on software so as to impact progress in the public sector and to launch the attributes of a "Smarter Planet." Their goal was to produce new models to meet the information and communications technology (ICT) needs of the Contemporary world.

A year later, Cisco launched its own initiative. Known as "Smart+Connected Communities," it presented a model that was similar to IBM's. Subsequently, other technology companies joined the party, among them Siemens, Ericsson, Huawei, Microsoft. In recent years, Google has joined as well (through its subsidiary SIDEWALKLABS).

Based on specific assumptions, IBM and Cisco both advanced the development of new technologies comprised of sensors, communication systems, and revolutionary technologybased business models. The competition between them was intense, and each presented different models and approaches, which complemented each the other. IBM based its approach on software and consulting services (data analytics, information compression, insight and strategic planning). Cisco, for its part, specialized in hardware: construction and maintenance of hardware, particularly network infrastructures.

Urban futurist Anthony Townsend put it this way: "If Siemens and Cisco aim to be the electrician and the plumber for smart cities, IBM's ambition is to be their choreographers, superintendent, and oracle rolled into one." (Anthony Townsend, *Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia*).

Both approaches, combined, have shaped the definition of the "Smart City" over the past decade. The two companies competed for the attention of the municipalities that were aiming to be in the forefront of the turnover to the smart city. In fact, initially, cities began to be known as "Cisco cities" or "IBM cities," depending on their approach to planning (even if they turned to alternate technological companies to provide the actual technology).

The major paradox of this reality was, and still is, inattention to issues of ethics and values that arose from the race to a smart city. Companies strove to inscribe their imprint in various core areas (particularly infrastructure and management), without giving consideration to how technology and information systems could enhance urban sustainability, or how they could assist cities and towns of various sizes, characteristics, or economic structures to cope with the myriad challenges of urbanization and climate change (specifically population growth, housing shortages, the reduction of available resources, and extreme natural or manmade events).

In other words, the companies offered systems with the potential to improve the aforementioned situations, but offered no structured program to guide the municipalities in implementing the technologies in ways that would be the most beneficial and effective.

It must be stated, however, that, in recent years, the situation is changing. Bit by bit, consulting companies and market research institutes, many of them funded by IBM (Frost & Sullivan) or Cisco (IDC and OVUM), began to analyze the extent of existing and future

markets and have begun offering services on *how* to implement technology in a more beneficial and sustainable manner.

Also, by defining the relevant technologies and applications for business analysis, they began to look at cities that were using such methods of operation and examining the depth of their procedures. They observed tensions between the radical concept of a "future city" that boasts of using "bright and shiny" technology-rich solutions to meet its challenges, and between the well-designed, sustainable city that sensibly seeks to combine strategic solutions, and considers efficient planning to be an evolving tool for creating a gradual and functional change.

What is a Smart City?

There are about as many definitions for a "Smart City" as there are number of cities, and the definitions constantly change depending on what the "new, trending concept" is.

At present, more than **50 different definitions** have been suggested. Most of them focus on hierarchical concepts with an emphasis on technologies instead of on values or civil involvement. Here is a small sampling:

Smart Cities Council, the body that represents the majority of global technology companies, defines a smart city as:

" A smart city is one that has digital technology embedded across all city functions."¹

ITU (International Telecommunication Union) emphasizes technology, but also mentions values and goals:

"A smart sustainable city is 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 and environmental aspects."²

Government of India, which developed a program to develop 100 smart cities, chose to deliver a broad (and very non-technological) definition:

"A Smart City offers sustainability in terms of economic activities and employment opportunities to a wide section of its residents, regardless of their level of education, skills or income levels."³

International Organization for Standardization (ISO) has suggested a definition that combines an extreme technological process and an administrative planning approach: *"The city dramatically accelerates the rate at which it improves resiliency and sustainability by thoroughly improving the way it communicates with the public; implements cooperative management approaches; works according to urban areas and systems; uses data and integrates technology for better service and improved quality of life for those living or operating in the city (residents, businesses and visitors)."*

The UK Department for Business, Innovation and Skills (BIS) on the other hand, chose, in 2013, to present a more open and correct approach:

"Smart cities [are] a process rather than a static outcome, in which increased citizen engagement, hard infrastructure, social capital and digital technologies make cities more livable, resilient and better able to respond to challenges."⁴

¹ https://www.facebook.com/AcapellunA/videos/656765784723009/?t=33

² Smart sustainable cities: An analysis of definitions (2014). ITU-T Focus Group on Smart Sustainable Cities 2014

https://www.itu.int/en/ITU-T/focusgroups/ssc/Documents/Approved_Deliverables/TR-Definitions.docx

³ Developing India as Smart Tourism Destination - A Sap-Lap Analysis (2018). Available from:

https://www.researchgate.net/publication/311771160_Developing_India_as_Smart_Tourism_Destination_-_A_Sap-Lap_Analysis [accessed Sep 27 2018].

⁴ BIS (2013), Smart Cities Background Paper, London: Department for Business Innovation and Skills.

Existing Rating systems for Smart Cities

Since early on in modern times, countries, cities, and towns have been rated comparatively in an effort to enhance their reputation and attract visitors and investors to boost their economy. However, it has been mainly countries or large cities that have been included in comparative ratings regarding employment, economy, or innovations (e.g., the World Bank's Doing Business index, the Mercer Quality of Living index, or in the Global Innovation index).

Comparably, smart city indexes (created under the direction of technological vendors or by those who see value in innovation alone), generally focused on large and economy-oriented cities (for example, the **IESE Cities in Motion index** or **Boyd Cohen's Smart City Wheel**, that have, since 2012, annually rated ten smart cities on each continent). The **Huawei Smart Cities index** in Britain does in fact rate smaller-sized municipalities, but it focuses primarily on technology, as does the **EasyPark smart cities index**.

Other indices focus on specific issues rather than overall management of cities, such as the **UCLG (United Cities and Local Governments) index** and the **Global Startup Index**, which examine only how the city adapts to innovation and entrepreneurship, or the **Deloitte City Mobility index**, which examines only the subject of urban mobility.

The "**Smart Cities: Ranking of European medium-sized cities**" initiative, differs from the aforementioned indices. It was created in 2007 at the initiative of the University Vienna (TUWIEN) in collaboration with the University of Ljubljana and Delft University of Technology and surveyed 70 medium-sized cities in Europe with respect to six major features: smart economy, smart transportation, smart environment, smart governance; smart people, and smart habitat. According to its proponents, the index's goal is to consolidate and equalize factors to allow measuring the uniqueness, weaknesses and strengths, growth, and development potential of those cities.

However, although the index is called an "Index of smart cities," it is actually a list of various statistic, such as number of self-employed and unemployed, number of post-secondary school graduates, number of library subscriptions, how many citizens voted in elections, women's representation in local government, quality of educational institutions, accessibility to public transportation, pedestrian safety, hours of sunlight, civilian involvement in environment protection, number of tourists, and so forth. Only **three** of the 74 parameters actually concern innovation or technology.

Alongside this, for over a decade, government and global organizations have been measuring urban sustainability and rating environmental sustainability. For example, LEED (Leadership in Energy and Environmental Design, US) and BREEAM (Building Research Establishment Environmental Assessment Method, UK) offer standards for sustainable neighborhoods, alongside the Arcadis Sustainable Cities index, and **ISO's** 371204 standard for smart sustainable cities, which includes 100 indicators to measure urban sustainability. However, these indices are mainly concerned with sustainability and the environment and omit examining the benefits that innovation and technology can add not only to sustainability and the environment, but also to urban resilience and urban management.

A Call for a New Smart City Index

In light of the above and the current indifference of the reviewed rating tools, to issues of developing strategies for integrating technology to provide appropriate solutions to the unique challenges of every city and town, it was decided to create the **IDC Smart-and-Sustainable-City Index**.

This index strives to reach the proper balance between technology and the environment and between economic benefits and social and environmental values. This, while appreciating the difference between one city and the next, between the potential for innovation processes, smart and dynamic strategies, and the correct and applicable use of technologies and information systems for improving the quality of life, resilience, and urban sustainability.

This new Index considers the process, as much as the solution and the impact of the solutions, as much as the way they were deployed, towards a more sustainable and resilient built environment, based on the UN's Sustainable Development Goals.

The IDC SSCI "Smart City" Definition

Given the enormous gaps between the challenges facing individual cities and towns, and the different potential values of innovative tools, we have chosen to adopt an approach that integrates efficiency and value.

Our intention is to emphasize the importance of management's approach and innovative planning as the core of a proper, well-thought-out plan that will be *and remain* effective:

According to our approach, a city will be considered "smart" when

... both city managers and residents share and use data, information and knowledge to ensure a sustainable future.

This will be achieved by

Inclusive data-led management and planning,

efficient community-based infrastructure & services

and -localized and shared innovation and economic development

The Value of the Smart and Sustainable City

Smart and sustainable cities can provide real value when they are based on modern technologies and use model analysis and up-to-the-minute tools and processes to do the following:

Engage citizens and other urban stakeholders.

Technology can help in reaching broader audiences, enable city-wide civic engagement, and encourages community level accountability and co-responsibility, towards a more resilient society.

Localize infrastructure, utilities and services through co-ownership & co-creation

This may reduce the gap between supply and demand for infrastructure and services, while simultaneously reducing costs and improving the efficiency of urban systems.

Use accurate, & relevant data for planning and management processes.

Thus, the city will be better prepared to manage urban challenges that arise from pressures ranging from the varying day-to-day needs of its citizens to strategic, long-term issues of adaptation to climate change or responding to critical events.

Promote digital transformation of municipal and financial services.

This will improve service delivery while reducing costs. It offers a more reliable and attractive local business environment.

Combine innovative approaches in formal education.

This is necessary to produce the next generation of informed citizens, scientists, entrepreneurs, teachers, and leaders, who will be fully prepared for the complexities of 21st century.

Develop smart and performance-based policies and regulations.

In a dynamic and complex era, municipal leaders will be able to "feel the pulse" of their citizens and react to urban, economic, and social changes as they emerge, while constantly improving governance and regulatory objectives and visions

Create localized and challenge-based financial opportunities.

This can lead to the formation of partnerships between innovators and the corporate sector to meet shared objectives and needs, while reducing costs for local authorities and improve the competitiveness of the local business sector.

Combine resilience and sustainability strategies into resource and service management.

Technology can help make better and more informed decisions that consider social, economic, environmental, and governmental aspects. Leaders will be better equipped to handle unexpected changes and critical events in the city.

The IDC Smart-and-Sustainable-City Index: Fundamental Principles

The IDC SSCI is not merely *another* index that examines solely the level to which technology has been adopted into the workings of the city.

Its uniqueness is in the level to which technology has been adopted in a sensible manner and effected impact for all citizens.

Its systematic scoring method encourages using innovative technological tools and processes to affect a tangible improvement in governance, equality, sustainability, and urban resilience, based on the following principles:

1. Promotion of Urban Sustainability

The core of this index is to encourage the town or city's compliance with the United Nations' Sustainable Development Goals (SDG), and particularly goal no. 11, <u>Sustainable Cities and</u> <u>Communities:</u> by answering to the call for *"cities that provide opportunities for all, with access to basic services, energy, housing, transportation and more"*.

This goal was expanded upon in 2016, at the United Nations' Habitat III Conference in Quito that was entitled "A New Urban Agenda" and that called for the following:

- To ensure services for all
- To ensure equal opportunities for all citizens
- To promote measures supporting cleaner cities
- To strengthen urban resilience and minimize the dangers and effects of extreme events
- To tackle climate change by reducing greenhouse gas emissions
- To improve accessibility and connectivity while supporting innovation and green projects.

2. Addressing local challenges.

The IDC SSCI does not aim to offer generic solutions for generic problems. Instead, it aims to reward a city's strategic thinking for providing a suitable response to unique challenges. With this in mind, the index does not offer a "recipe" for a smart city. Instead, it provides a way to rate the city's administrators' success in building a strategy tailored to the city's unique challenges, through a combination of innovative procedures, cooperation between stakeholders, information systems, and technology.

It is clear that innovative solutions and processes that are suitable for one city, will not necessarily be applicable to another.

3. A Smart & Sustainable Playbook.

The IDC SSCI is not simply a scorecard for accumulating points; it is, rather, a tool to assist the city in becoming smarter and more sustainable. For this reason, **the index is constructed to offer a logical, chronologically ordered, step-by-step process** that begins with defining the intended strategy (what we want to solve and how?), continues through constructing a definitive plan (what tools shall we use to provide a response to the challenges; how will we make sure it happens?), and culminates with monitoring the actions themselves and

ensuring that they have been carried out using a scientific and economic combination of actions to elicit the most correct response for the specific city (in areas of infrastructure, services, and regional sustainability). A city will not be deemed "smart and sustainable" unless it goes through the entire process described by the index.

Furthermore, our intention is not to compare one municipal authority with another (although the result is indeed comparative), but to lead each civic authority forward and to measure the degree of improvement and excellence in relation to itself – from the initial stage in which they are at present, and into the future. The index aids in the development of strategies and then provides validation of compliance.

A worthy, synergetic solution can provide an answer to more than one urban challenge. Therefore, even one decision or action on the part of the city can lead to an accumulation of points in more than one section and subsections of the index.

4. Self-improvement (not a mere reflection of the current situation).

The IDC SSCI does not assess the municipality on its initial data (peripheral location, air quality, human resources, educational level, and ecological status). Rather, it examines the city's vision and the strategy that it sets for itself. Thus, while it may seem that a city that is richer or whose residents are better educated may have greater potential to become smarter, in fact, a "poorer" city that successfully defines its goals in accord with its unique challenges and then works to face those challenges based on the provisions in the index may, in fact, receive a higher ranking.

5. Promotion of values, not products.

The IDC SSCI aims to guide cities to improve values and quality of life rather than to simply introduce or expand their usage of technology.

A city that introduces technology for the sake of technology, without producing impact & value, will be rated lower than one in which technology improves the existing situation or helps meet defined city goals. Thus, first and foremost, this index aims to guide its users to create a localized vision and goals – and only after that, to measure performance by analyzing how it benefited its citizens.

6. Assessment of innovation, not (just) technology.

The IDC SSCI will guide the authorities to think outside the box to respond to local challenges. The answer does not always have to be technological. Sometimes it will be smart planning, training, implementation, or regulation processes.

The Components of the IDC Smart-and-Sustainable-City Index

This IDC SSCI includes 4 parts, 21 sections and 40 sub-sections that examine the strategies, design, and implementation of smart urban actions, as follows:

Part I: Strategy, Resilience, and Sustainability

The existence of localized, shared & transparent municipal action plans that provide suitable strategies for addressing issues of sustainability and urban resilience as preliminary steps to implementing technologies and smart processes, including:

Preparation of a smart city master plan; Urban sustainability and urban resilience action plans; Innovation & strategic planning teams; Formulation of urban data strategies; and stakeholders' engagement in the preparation and monitoring of the Smart-City plan.

Part II: Management, Planning, and Governance

The practice of smart management and decision-making, utilizing digital tools, information technologies (ICT), and Civic engagement & management tools as necessary steps in the development of a genuine smart city, including:

Data-based management & planning; Smart Policies & regulations; Municipal Transparency; and digital public participation and engagement.

Part III: Infrastructure, Construction, and Environment

Planning, managing, and constructing of smart & sustainable urban infrastructure and services while ensuring their suitability for improving the local urban sustainability, serviceability, and resilience, including:

Designing & executing of Green Buildings and Communities; Ensuring housing for all; Public health & wellbeing; Smart & Sustainable physical infrastructure; efficient & demand-based municipal services; and Inclusive digital infrastructure.

Part IV: Innovation, education, local economy

Reducing the technological gaps between various sectors by encouraging 21st- century skills for all residents, cooperation between stakeholders, systematic policies to encourage growth of small-and-medium-sized businesses, and innovative local initiatives, including:

Digital education and literacy; Locally related educational excellence; Urban innovation; and Smart & Shared local economy.

Section	Subject	Sub-sections	Max score	My City
Part I: Strategy, resilience and sustainability			15	
1	A smart city masterplan		4	
2	Stakeholder engagement		2	
3	Urban sustainability action plan		2	
4	Urban resilience strategy		2	
5	Management of innovation & strategic processes		2	
6	Urban data strategy		3	
Part II: N	Management, planning and governance		20	
7	data-based management and planning	Using GIS as a multi-departmental tool	2	
		Data-based decisions in municipal operations & services	2	
		Data based evaluation of success or economic efficiency	1	
8	Smart policies and regulation		1	
9	Digital municipal services	Frequent & efficient use of the municipality's website/app	2	
		Essential services accessible through the municipal website	4	
10	Municipal transparency		4	
11	digital public participation and engagement		4	
Part III:	Infrastructure, construction and environment		45	
12	Green and sustainable buildings and	Buildings meeting green building standards	2	
	neighborhoods	Policies to improve sustainability in existing neighborhoods	2	
		New neighborhoods planned according to sustainable	_	
		community rating systems	2	
13	Housing for all		2	
14	Public health and wellbeing	Smart initiatives to improve health, welfare, and wellbeing	2	
		Sensors to measure & inform of noise and pollution	4	
15	Smart and sustainable physical infrastructure	Smart control & management of municipal infrastructure	2	
		Systems to improve energy efficiency in public areas and buildings	4	
		Community based management of infrastructure	4	
16	Smart and demand-based municipal services	Smart Initiatives to encourage behavior change in the use of services and resources	3	
		Smart Initiatives aimed at improving urban mobility	3	
		Smart Initiatives aimed at improving public safety	3	
		Smart Initiatives aimed at reducing waste	3	
		Innovative projects to improve access & use of public spaces	3	
17	Inclusive Digital infrastructure	Free Internet in public areas	2	
Dort IV/	Innovation advantion and local approxy	city-wide internet infrastructure strategy	4	
Part IV:	Education and digital literacy	Digital literacy and 21st century skills	20	
10		Digital training for municipal employees	2	
19	Educational excellence	Educational initiatives geared to answer to local challenges	2	
		Cooperation between the municipality and research institutes	2	
20	Urban innovation	Physical spaces for urban-technological innovation	2	
		Municipal policies for urban-technology beta testing	1	
		Focus & branding of employment, entrepreneurship, and	1	
21	Smart urban economy	Municipal support in innovation among local businesses	2	
	· · · · · · · · · · · · · · · · · · ·	Digital tools to support local businesses	2	
		Shared economy initiatives in the city	-	
	I	Total	100	

Overview of the Index's Parts, Sections, and Sub-sections & Possible Scoring

The IDC Smart & Sustainable City Index



Part I: Urban Strategies for the Smart & Sustainable City

A smart city is one that strives to provide solutions for local challenges based on a systematic strategy that can be measured and evaluated.

A smart city does not only mean the implementation of technology. It needs – even prior to this – a clear-cut strategy tailored to the uniqueness of the district and its population and geared to meeting local challenges in accordance with budget constraints and local capabilities and the potential action plans resulting from these.

One of the major challenges of the smart city is being able to measure, monitor, and control these actions and their impact. Thus, the strategy must include steps that can be quantitatively measured, methods for monitoring and assessment, and means of optimizing the program based on the results the assessment.

Part I of the Index assesses the overall management process, and examines the existence of systematic, shared, transparent plans that are geared both to the formation of a smart city and to formulate local municipal strategies for urban sustainability and resilience.

Total in part I: Six themes and six indicators. Possible score: **15 points**.



Steps in the planning and implementation of plans for smart cities, from the National Plan for Smart Cities in Rwanda, 2017 (Unhabitat & Smart Africa Alliance, compiled by SUITS and Rafi Rich, Architect).



Theme 1: Preparing a Smart City master plan (max score - 4 points)

In recent years various authorities have proposed initiatives to step into the "smart" 21st century, but without offering a structured program or quantitative methods to monitor success in implementing the goals.

Implementation of innovation and technology without a systematic plan, clear goals, and a clear path for reaching tangible targets, may hinder the realization of other municipal goals and compete with other pressing budgets or needs. Worse, it can harm certain populations or city areas. For example, digital transformation of a municipal service ensuring that all citizens have digital access result is gaps in service to the community and empty municipal coffers.

Therefore, this theme ensures that "Smart City" initiatives are well-planned and executed, based on a multi-year masterplan that has undergone approval, been allocated a budget, and has been strategically coordinated with other areas of municipal activity to ensure its implementation.

objective	indicators	Max score
Preparation and approval of a "Smart City" plan by	A comprehensive, multidisciplinary approach to implementing a smart city that includes a municipal vision, objectives, and a roadmap. This plan may stand alone or be part of an overall municipal strategy to solve municipal challenges. The municipal management must approve and allocate a budget for the plan.	4
local authorities	 Plan prepared (not yet endorsed by city council), 1 pt. Plan approved (municipal budget not yet allocated), + 1 pts. Plan fully approved and budgeted - full points, +2 pts. 	



Answers to UN's Sustainable Development Goal (SDG)no. 11: <u>Sustainable Cities and</u> <u>Communities:</u> "... provide opportunities for all, with access to basic services, energy, housing, transportation and more."

In addition to this central objective, a strategic plan for smart city must address all 17 goals of the index (provided they are relevant to the city).

Case study: Strategic plan for Vienna's smart city

In March 2011, the Mayor of Vienna announced the Smart City project. A plan was formed in conjunction with the municipal stakeholder and various government bodies, professionals, and the general public. It was managed by the Planning and Strategy Division to ensure full coordination and integration between the smart city plan and the city's existent vision and policy documents. The Viennese Urban vision set forth three main goals and areas of activities:

"It is thus the key goal for 2050 of Smart City Wien to offer optimum quality of life, combined with highest possible resource preservation, for all citizens. This can be achieved through comprehensive innovations." The plan includes 385 measurable, long-term goals that are to be met by 2050, and



the implementation was divided into separate three-year plans. The entire process is today managed by a special government agency dedicated to implementing the smart city vision. https://www.wien.gv.at/stadtentwicklung/studien/pdf/b008384b.pdf

Strategy Management Infrastructure Innovation

Theme 2: Involving stakeholders in the "Smart City" program

(maximum score - 2 points)

Urban programs are doomed if they do not involve both those affected by them and those who are expected to promote them. In the case of a **Smart-City** plan, this factor is crucially important. A "Smart City," as stated, does not only mean the application of technology: It requires changes in the management and work process style of many municipal departments and input from citizens, as the introduction of technology may have adverse effects on privacy, quality of life, and existing work processes.

To be successful, the plan must already include stakeholders in the initial formation process, and then, after approval, in monitoring its application (to better comprehend what works and what needs improving). Such involvement will increase the public's and municipal employees' willingness to cooperate, encourage the public to share information (even at the cost of reducing some privacy), and most importantly, encourage collaborative processes that require responsibility and public initiative.

Essence	Scoring properties	Max score	ln my town.
Internal and multi- sectored organizational cooperation in the preparation and application of the	Involvement of stakeholders from within the municipality and from external sectors (representatives from the community, professional, industry, and relevant and/or local academia sectors) in the steering committee and work teams preparing the Smart-City master plan and in the teams overseeing the plan.	2	
municipal Smart City plan	Direct involvement of relevant municipal departments, 1 pt. Formal involvement of stakeholders from different sectors, 1 pt.		



Answers to UN's Sustainable Development Goal (SDG)no. 17: <u>Partnerships for the</u> Goals: *"Revitalize the global partnership for sustainable development."*

In addition to this central goal, this section also pertains to Goal 5 (<u>Gender equality</u>: "Gender equality is not only a fundamental human right, but a necessary foundation

for a peaceful, prosperous and sustainable world.") and Goal 10 (<u>Reduced Inequalities</u>: "To reduce inequalities, policies should be universal in principle, paying attention to the needs of disadvantaged and marginalized populations.") in cooperation with all stakeholders.



Case study: Public participation in Birmingham, England's "Smart City" plan

The main challenge to Birmingham, the second largest city in England, was its population growth rate, expected to be 10% in 2026. In July 2012, as a basis to their agreement to the plan, the City

Council founded the Smart-City Committee, consisting of representatives of business and academia. Other stakeholders took part in preparing the document using a process of public consultation. Next, a forum of stakeholders interested in the smart city concept was established, and responsibility for managing and coordinating the Committee was given to a new body, Digital Birmingham, which leads the implementation, coordinates between the various municipal institutions and business partners, and ensures the involvement of stakeholders (through the publication of monthly and annual reports). One of their main initiatives is the Smart City Demonstration Center, which invites public cooperation in developing projects and deciding what



type of information is collected and what use made of that information.

http://digitalbirmingham.co.uk/

Infrastructure



Section 3: Applying a strategy for urban sustainability (maximum

score - 4 points)

The frequent changes in the urban sphere and the complexities of municipal administration in the 21st century require a strategic response that will ensure public safety and welfare and maintain the balance between economic growth and sustainability and environmental quality. Considering this, and because of the need to ensure that the smart city *is* sustainable, urban strategies in the context of a smart city must rest on the understanding and commitment to conservation, natural-resource management, balanced sustainable management of municipal services and operations, reducing emissions and pollution, and concern for the health and welfare of the public.

An example of this type of document can be seen in the masterplans constructed by the authorities of the 15th Forum, in light of their commitment to reducing carbon emissions and coping with climate change: (http://www.forum15.org.il/Category.aspx?id=84).

Essence	Scoring properties	Max score	ln my town.
Preparation and application of a municipal action plan for urban sustainability	Approved urban master plan that addresses sustainability, or an official policy document regarding sustainability issues, including quantitative and qualitative multi-year targets that refer <u>to at least</u> <u>three</u> of the following areas: transportation, construction, energy, water, waste management, social services, open spaces, public spaces.	4	
	an approved by city council, 2 pts. Program implementation in accordance with the work plan (for at least 1 year), 2 pts.		



Answers to UN's Sustainable Development Goal (SDG)no. 15: <u>Life on Land:</u> Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss.

In addition to this goal (and of course, Goal no. 11), this section also pertains to Goal 3 (Good Health and Well-Being: "Ensuring healthy lives and promoting the well-being for all at all ages is essential to sustainable development"), Goal 6 (Clean Water and Sanitation: "Clean, accessible water for all is an essential part of the world we want to live in"), Goal 7 (Affordable and Clean Energy: "Energy is central to nearly every major challenge and opportunity"), and Goal 13 (Climate Action: "*Climate change is a global challenge that affects everyone, everywhere*").



Case study: Master plan for sustainability and the environment, Vaxjo, Sweden (named European Green City, 2018)

Vaxjo, a Swedish city of approximately 80,000 residents, has already been nurturing sustainability for many years. The new plan is an update of the 2010 program that was proclaimed after deciding to cease using fossil fuels by 2030. The plan deals with three issues "live the life," "our nature," and "a carbonfree city" and sets measurable goals for consumption and procurement, waste collection, inspection and enforcement, improving drinking water, care and preservation of nature, reduction of pollution, noise, green carbon-free construction, energy consumption, and reducing the number of motor



vehicles. Each segment of the plan has a body responsible for its implementation, and the program interfaces with all municipal plans and its funding is part of the annual municipal budget. Among the main projects carried out in recent years: creation of an urban heating and cooling network that includes smart monitoring and control of energy consumption, construction from wood and other local materials, a transition to bicycles as the major vehicle, using bio-gas to fuel transportation vehicles, reducing carbon emissions by 40% within 20 years.

http://www.vaxjo.se/download/18.313cf36515d1bde9ee3205fa/1499862622018/Miljoprog rammet_eng_webb.pdf



Theme 4: Urban Resilience policies (maximum score - 2 points)

Climate change, extreme events of nature and acts of terrorism and warfare are phenomena that have tremendous effect on the normal existence of municipalities and local authorities where such events occur. And while such events are seen to be within national jurisdiction - the city mayor also bears responsibility towards its citizens, and therefore, local authorities must have the power and responsibility to initiate preliminary actions to reduce impact and to manage the crisis and initiate rehabilitation. Contingency plans must be based on threats and scenarios relevant to the locality in question, and may include mapping sensitive urban areas/facilities, creating management and control systems for critical times, installing warning systems, performing actions to reduce the likelihood or severity of such events or to ease dealing with them (for example, setting up a plan for water diversion plans to reduce the likelihood of flooding, or shielding and strengthening buildings and infrastructures in vulnerable seismic areas, setting up emergency communication networks). A city will be deemed "smart" when it can guarantee rapid response to reduce the damage, ensure minimal negative effect for its residents, and promise its citizens wellbeing in the event of such occurrences. Technological tools can assist in the prediction, control, and management of such crises, but it must be taken into account, that relying on digital tools to respond to such events leaves an opening to a cyber-crisis.

Essence	Scoring properties	Max score	ln my town.
Developing an urban action plan to cope with climatic, environmental, and security crises, such as drought, heat waves, floods, fires	An approved municipal work-plan and strategy that includes the principals of the contingency plans of the municipal authority and of the community to cope with extreme scenarios relevant to the city and its surrounds, including the use of technological means such as sensors, the survivals of infrastructure, information systems, and smart management methods.	2	
earthquakes, and terrorist incidents	An approved municipal document providing details of the response to be taken in case of relevant possible scenarios, 2 pts. At this stage, given that most authorities still are not acting in this issue, the points are given in addition to the existing score, the goal being to plot the direction and prepare the groundwork for the following parameters.		



Answers to UN's Sustainable Development Goal (SDG)no. 13: <u>Climate action</u>: *"Climate change is a global challenge that affects everyone, everywhere."*

In addition to this goal (and of course, goal no. 11), this section also comes to reduce the gaps arising from the crisis situation, and thus also pertains to Goal

3 (Good <u>Health and Well-Being</u>:

"Ensuring healthy lives and promoting the well-being for all at all ages is essential to sustainable development"), Goal 6 (Clean Water and Sanitation: "Clean, accessible water for all is an essential part of the world we want to live in"), Goal 7 (Affordable and Clean Energy: "Energy is central to nearly every major challenge and opportunity"), and Goal 10 (Reduced Inequalities: "To reduce inequalities, policies should be universal in principle, paying attention to the needs of disadvantaged and marginalized populations").

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Case study: Urban resilience strategy, New Orleans, USA

In 2005, New Orleans was hit hard by storm "Katrina." After recovering, the municipality, with the assistance of the Rockefeller Foundation, prepared a resiliency strategy that links the extreme events to social and economic inequality. The program comprises three major themes: "Adapt to thrive" (conservation and protection of the water line, innovative systems for urban water management including early warning systems to track extreme events, incentives for private sector investment in risk management, creating a culture of environmental awareness) ; "Connect to Opportunity" (investing in the financial stability of households,



removing employment barriers, promoting equality in the healthcare system, strengthening social cohesion, increasing access to safe and affordable housing); "**Transform City Systems**" (redesigning traffic and transportation systems to make industrial and service areas accessible, promoting sustainability and providing models for growth, improving the durability and reliability of energy systems, implementing decision-making processes that rests on strong decisions, investing in specialized urban development, developing readiness in the community and business sectors).

https://www.100resilientcities.org/strategies/new-orleans/



Management

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Theme 5: Management of Innovation & Strategic processes

(maximum score - 2 points)

Commonly, local authorities tend to engage in providing 'band aid' solutions to unpredictable external events. In addition, the built-in partitioning across departments and the difficulty involved in coordinating cooperation that is a result of the decentralization of power, makes it difficult to initiate long-term, thoughtful managing procedures that veer from routine and where the authority of individual municipal departments is undermined. This difficulty increases when trying to establish new, innovative procedures that naturally invite resistance and suspicion. Thus, it is necessary to identify an integrating body who has the professional knowledge, resources, and authority to plan, oversee, monitor, and update impending courses of action. It is recommended that members of the team will have the authority to implement coordination as well as the capability to mediate in the event of conflict or opposition from within and without.

With this in mind, a prerequisite for the successful implementation of Smart-City strategies is the identification and appointment of a director and staff dedicated to this matter and who have the authority and ability to introduce multidisciplinary changes throughout the municipality if needed.

Essence	Scoring properties	Max score	ln my town.
A dedicated municipal team that is responsible for promoting urban innovation and strategy	A new or incumbent director and manpower who are officially responsible for overseeing urban innovation and knowledge-based urban strategies, including management and control of the municipal plan for smart, sustainable and resilient cities. They will operate directly under the mayor or CEO.	2	
5	Appointment of staff dedicated to coordinate procedures, 2 pts.		



Answers to UN's Sustainable Development Goal (SDG)no. 16: <u>Peace</u>, justice and strong institutions: "Access to justice for all, and building effective, accountable institutions at all levels."

In addition to this goal (and of course goal no. 11) this section improves the management and responsibility, and the ability to initiate innovation in resource management and services, and thus also addresses goal 17 (Partnerships for the Goals: "*Revitalize the global partnership for sustainable development*").

Case study: New Urban Mechanics Team in Boston, USA

"New Urban Mechanics" is an urban innovation team founded in 2010 by the mayor of Boston with the goal of implementing innovation to deal with urban issues and challenges – beginning with urban infrastructure construction, through public cooperation and education, and culminating in the reduction of gaps in society and municipal



services. The team works with city departments to improve service, elucidate the



communities' needs, initiate innovative solutions to local needs and challenges with technology companies and examine their suitability for the city. The team is not involved in the day-to-day workings of City Hall; its role is to support current initiatives and processes and to consider the mayor's philosophy about the most suitable methods to solve complex, multi-departmental issues. The team has initiated, inter alia: examination of new forms of housing and smaller apartments, development of a municipal computer application (including App 106, which is used in many cities globally), launch of a public collaboration platform in the form of an augmented reality Pokémon-Go-style game, introduction of systems to monitor road quality, the setup of a mobile municipal services center, initiation of cooperative platforms between the city and academia, and more. The team was awarded the US President's Prize for Innovation in the Public Sector.

https://www.boston.gov/departments/new-urban-mechanics



Theme 6: Developing a strategy for urban data & knowledge

(maximum score – 3 points)

In the smart city of the 21st century, data is continuously being collected – directly by the authorities or by bodies acting on its behalf. In practice, and given the absence of any policy concerning this issue, the information remains raw and has little effect on urban management. Even when the municipality decides to gather specific information, random and non-contiguous management can lead to administrative failure or unreliability of the information (consequently wasting public funds). In extreme cases, the public's privacy may be compromised and there is risk of cyber threats.

Therefore, it is essential to formalize a strategy for dealing with harvested information, including identifying n those officials who will be responsible for managing the process and what steps will be taken to assure reliability, robustness, and endurance. (In the case where the municipality hires an external company for information management services, the municipality still needs to appoint an employee whose responsibility it will be to verify that the information is managed properly and to oversee the external consultant).

Essence	Scoring properties	Max score	ln my town.
Urban policy for collecting, processing, sharing, and saving information	A comprehensive municipal plan regarding information and knowledge that will determine how information and knowledge will be handled in the city. This plan may include listing those areas in which the city will gather information (qualitative or quantitative); when they are gathered (periodic or real-time); information-collecting method(s) (sensors, online, databases, interviews); identity of the surveyors (civilians, municipal employees, experts in information processing and use of data); access to information (who is authorized to view the information; how, when and what will be the nature of the collaboration between different departments, other agencies, or the public); ownership of the information (who will manage it, how validation will be made, how, where, and by whom will it be stored); how the information providers' privacy will be maintained; information security; durability).	3	
	Urban policy approved and implemented – (prerequisite), 1 pt. Technological system to manage information 1 pt. Dedicated staff to manage information (e.g. CKO), 1 pt.		



Answers to UN's Sustainable Development Goal (SDG)no. 16: <u>Peace</u>, justice and strong institutions: Access to justice for all, and building effective, accountable institutions at all levels.

In addition to this goal (and goal no. 11) this section improves transparency and maintaining privacy and the right-to-information, and thus also addresses Goal 10 (<u>Reduced Inequalities</u>: *"To reduce inequalities, policies should be universal in principle, paying attention to the needs of disadvantaged and marginalized populations"*) and Goal 17 (Partnerships for the Goals: *"Revitalize the global partnership for sustainable development"*).

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Case study: NYC Analytics – The information management unit of the City of New York.

The Mayor's Office of Data Analytics (MODA) in the New York's Department of Strategic Planning Policy, is a knowledge management unit that was established in 2009 and has five employees. The unit allows New York to sample and analyze data from 20 departments and local



organizations so as to provide a more effective response to crime, security, and quality of life. The department focuses on five main areas: support for activities of municipal units by implementing information-based solutions to municipal services; building a platform for sharing knowledge and information between the municipal departments and training information personnel; managing information and knowledge concerning urban resiliency and emergency services; initiating information systems for promoting business in the city; and managing and constructing a municipal "Open Information" system. http://www1.nyc.gov/site/analytics/index.page.



Part II: Smart, Information-based Municipal Management

A Smart City makes decisions and operates based on up-to-date data and information.

Decision-making in the 21st century is not as straightforward as it used to be. There is a constant sense of uncertainty in the face of a perpetual change of needs, resources and challenges. Management approaches that were once applicable are not necessarily sufficient in the first decades of the 21st century.

To respond appropriately to changing urban challenges requires adopting appropriate administrative approaches to management that anticipate and consider emerging situations at the same time that they consider evolving opportunities and novel solutions.

Today, there is a vast assortment of digital tools that enable better management. Using data in a Smart City reaches out beyond the mere use of the "Internet of things" (i.e., a network of machines and systems that collect and make data accessible) or clusters of "big data" (data collection on a massive scope that is quick to update). Indeed, the Smart City merges AI (Artificial Intelligence), BI (business intelligence) with Machine Learning (algorithms designed to allow the computer to learn from examples) to provide timely information to the authorities and citizens alike.

A Smart City is a city that implements innovative workflow methods that can take advantage of real-time access to data and information, thus improving governance and decision-making. Being able to monitor and update municipal strategy based on real-time data, leads to intelligent city management. This will enable the authorities to gradually move away from simply gathering information (*what* has happened), to up-to-the-minute analysis of information (*why* it happened), to intelligent projection (what can happen, when and why), and eventually arrive at a system that uses qualitative functional analysis (what can be done and how to choose the appropriate option).

The implementation of this level of urban intelligence requires the use of advanced tools and the diligence to build a system of digital management and services while simultaneously adjusting administrative concepts and encouraging real civic involvement and engagement from all the citizens. Indeed, this type of Smart-City administration sees the citizen as a partner who is involved in defining problems, suggesting answers, and implementing solutions.

This section evaluates the approaches to decision-making and management that the city takes with respect to its adoption of digital tools, use of information, system of management, and embrace of digital partnerships, each of which is a necessary step in the formation of a genuine Smart City.

Total in Part II:

Five sections and nine sub-sections. Possible score: 20 points.



Theme 7: Information-based management and design

(maximum score - 5 points)

The frequent changes in the structure of municipal authorities, alongside with the challenges and complexity of urban administration, rules out the feasibility of continued decision making based on annual reports or information gathered solely at the beginning of a project or for budgetary discussions. A Smart City must use up-to-date information as part of a constantly renewing decision-making process.

Today, most cities use geographical information systems (GIS), which are designed to capture, store, , analyze, manage, and present spatial or geographic data. A GIS provides real-time information of various events. However, they are generally only used by the municipality for planning and construction despite the fact that such systems offer a huge potential for upgrading management systems because they collect, display and process not only spatial and temporal data about *what* has occurred, but also the spatial context of the event. This makes it easier for city managers to draw conclusions and better understand the relationship between the form and characteristics of a neighborhood, the makeup of its population and the nature of its problems and challenges. When city managers can easily understand urban phenomena, they are better equipped to make decisions in real-time, or be able to prioritize projects and municipal operations with respect to the populations requiring them the most.

Similarly, a Smart City should base long-term strategies and decisions on the ongoing collection of information. For example, decisions regarding the establishment of educational institutions can be based on up-to-date information about resident profiles (rather than decisions based merely on average family size or some other characteristic), decisions regarding transportation routes can be based on information about the volume of commuters who are willing to travel by public transport and must get from point A to point B at a specific time (rather than planning based on real-time data will lead not only to budgetary savings but also to increased resident satisfaction. In addition, gathering immediate information during the test-run or initiation of some new urban action can point to problems that may lead to changing and re-planning aspects of the project or, if things appear to be off-target, abandoning it entirely. On the other hand, the scope of the project may be immediately expanded if it shows clearly initial success.

Essence	Scoring parameters	Max score	ln my town.
Using data and information systems as part of the city's management, strategy, and	 (a) Implementing various information levels in the urban GIS as real- time tools that are used in several municipal departments (not including design and construction) 1 point for each municipal department using GIS (not the engineering department, up to 2 pts 	2	
decision-making processes	(b) Resolving an operational issue or municipal service (for example, defining registration areas or modifying purchase decisions) based on timely information retrieval or real-time information that takes place during the decision-making process.	2	
	Management decision-making procedures that are officially based on intelligent information collection and processing, 1 pt. Application of this procedure at least once in the past year, 1 pt.		



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(b) A systematic method of collecting and processing information for	
the purpose of assessing the success and economic benefit of a	1
municipal initiative that was carried out within the past year.	T
At least one urban process that used information gathering for making	
a decision regarding the project's economic viability as a condition for	
continuing the project, 1 pt.	



answers to UN's Sustainable Development Goal (SDG) no. 16: <u>Peace</u>, Justice and Strong Institutions: "Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels."

In addition to this goal (and of course goal 11), this section improves economic and business certainty and therefore also addresses Goal 8 (Decent Work and Economic Growth), Goal 10 (Reduced Inequalities), and Goal 17 (Partnerships for the Goals).

Case Study 1: Energy mapping system and infrastructure project in London, UK

In 2004, the city of London decided to promote an urban energy strategy whereby carbon emissions and the "energy gap" between members of the population will be essentially reduced by 2050, along with increased economic growth and the creation of new jobs in the field of energy. As part of this effort, in 2008, City Hall



launched a GIS-based energy map that offers detailed mapping of energy consumption, supply and demand alongside the existing infrastructure. The map is being used as a basic tool for strategy planning of energy needs and projects, including making predictions of future needs. It helpsl to attract investors and entrepreneurs to participate in joint ventures in preferred areas of the city (where there are high energy demands, underprivileged areas

where there is a higher mortality as a result of the lack of heating, and other problems that required municipal intervention). In 2016, London City Hall launched an interactive GIS to help coordinate all the designers, regulators and investors involved in the city's infrastructure. The system included information on needs, infrastructure, and pertinent data related to future short-, medium- and long-term initiatives.

http://maps.london.gov.uk/ima

https:/Maps.london.gov.uk/heatmap/



Case study 2. Funding for parks restoration based on information in Philadelphia and throughout the USA

Municipal funding or grants from government agencies assigned to construction projects are often held up in light of the municipalities' desire to take into account the wishes of the general public before making decisions with respect to some specific project, alongside budgetary considerations (as the budget allocated is generally never enough to satisfy everyone's needs). In Philadelphia, Pennsylvania, cooperation between a local GIS company and a public association created an information system that evaluated the appropriateness, quality and availability of open (green) spaces in relation to the magnitude and type of population and the existence (if any) of other parks in the vicinity, to determine prioritization of projects.



This solution helped in addressing the expectations

of the communities' citizens themselves. It offered a networking tool that allowed the municipality to decide which neighborhoods should (first) receive funding and for which parks.

As a result of the project, which has led to several agreements between the municipality and the public, similar projects have been initiated in other cities throughout the USA.

http://nextcity.org/daily/entry/how-gis-can-help-spruce-up-philadelphias-playgrounds.



Theme 8: Smart policy and regulation (maximum score for this section - 1 point)

At the beginning of the 21st century, the Organization for Economic Co-operation and Development (OECD) initiated a process of "smart" regulation. Their approach allows adapting rules and regulations to meet the changing conditions prevailing at the time by simplifying policy and changing it into a process shared by the regulating body and those who are affected by it. For example, rather than setting a precise rule (e.g., solar water heaters must be installed on every rooftop), it defines a specific goal to be achieved (e.g., every new building must include effective systems to save 10% of energy consumption in the building).

As a result, responsibility is divided between the contractor (who must propose the solutions) and the municipality (which must ensure that they are implemented). A policy such as this opens the door to innovative initiatives and flexible alternatives that may be more appropriate than the "standard" ones for different areas or populations (e.g., there may be buildings where such energy saving will occur by itself, as these residents do not use air conditioners).

Because smart regulation leads to greater clarity with respect to the anticipated end-results, it opens the way for novel "smart solutions" in various ways, even in tenders. For example, on the one hand, one can simply state that a sanitation contractor must collect garbage twice a week throughout the city; alternatively, one can give the contractor the freedom to collect the garbage based on the frequency that bins are full (for example by installing a proper detector) and to invest in education to encourage recycling and reduction of waste. The city can require a public transport company to provide service to specific stations at specific times or allow it to provide service based on commuter volume, adding vehicles during peak hours and cutting back at times when there are no passengers at all. Thus, the contractor saves costs, which indirectly transfers these saving to the city and the residents, potentially enabling them to improve their quality of life.

The above is especially important with large-scale technology tenders: instead of forcing the use of an outdated technology solution (which might have been innovative in the early stages of the tender), the city sets the ultimate goal for the tender and allows the contractor to decide on the applicable solution to provide.

Functional regulations exist today in most countries, such as functional building codes, in addition, "smart" tenders, have become common practice, with BOT-infrastructure tenders (contractors commit themselves to a level of function and are rewarded by the number of users, actual consumption, or a fixed price whereby the incentive to be more efficient falls on the supplier).

Essence	Scoring properties	Max score	ln my town.
Establishing information-based urban policy and flexible, information- based tender procedures	The use of smart urban information-based policy to aid decision- making and offers of tender that address the desired outcome rather than a specific product or solution. The process includes clear, transparent demands and priorities for collection, validation and display of information to prove compliance with the tender requirements or municipal policies, and the means for occasional inspection of the quality of deliverables. A tender or urban procedure that includes budgetary or organizational implications and that is based on assessment of the actual outcome. Includes methods of assessment, transparency and information collection to verify the data presented, to allow supervision that demands were adhered to, alongside periodic changes and updates, 1 pt.	1	
Strategy	Management Infrastructure Innovation	<u> </u>	

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Answers to UN's Sustainable Development Goal (SDG)no. 16: <u>Peace</u>, Justice and Strong Institutions: "Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels."

In addition to this goal (and of course goal 11), this section improves economic and business certainty and therefore also addresses Goal 8 (Decent Work and Economic Growth), Goal 10 (Reduced Inequalities), and Goal 17 (Partnerships for the Goals).



Theme 9: Municipal digital services (maximum score - 6 points)

A Smart City is a city that provides adequate services to all its residents. The "average" city has gaps between desired and actual service; residents' complaints commonly focus on wasted time and bureaucratic complexity. Quality digital tools can dramatically improve access to municipal information and services and allow direct contact between the citizens and the municipality, leading to targeted services tailored to specific needs: age, gender, area of residence or culture.

As an example, a disabled person could access many services from home instead of having to go to facilities which have low accessibility; a resident who wishes to transfer a child from one educational institution to another would not be forced to visit City Hall several times but will be able submit the application online or send documents to automatically schedule a meeting; residents can be informed via a messaging app when it is time to register children in neighborhood schools; residents can obtain real-time information about critical environmental events that may be harmful to younger children through a targeted messaging application (neighborhood or age group).

In addition, all such information will be readily accessible to the entire population, including the disabled (e.g. the visually impaired) and those who do not speak the local language.

Essence	Scoring properties	Max score	ln my town.
The development of numerous quality municipal services	(a) App or website (or both) for residents, requiring advance registration and providing services tailored to the resident depending on his/her location, age or special needs	2	
that can be accessed digitally	At least 10% of the residents are subscribed to the service, 1 pt. Boosting the use of targeted services and information to a neighborhood, population group or sector, 1 pt.		
	(b) Accessibility of essential services through the municipal website and social networks, with an emphasis on reducing the need for having to physically go to municipal offices, and accessibility to clear, worthy, timely information for all city citizens and stakeholders.	4	
	Online payment option for at least two municipal departments, 1 pt. Online forms for at least four municipal departments, 1 pt. Monthly access to the site of more than 20% of the residents, 1 pt. Providing service or guidelines for online services in a language other than the local language, 1 pt.		



Strategy

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Answers to UN's Sustainable Development Goal (SDG)no. 10: <u>Reduced inequalities</u>. "*To* reduce inequalities, policies should be universal in principle, paying attention to the needs of disadvantaged and marginalized populations.

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In addition to this goal (and of course goal 11), this section improves accessibility and the relationship with different parts of the community and improves services to the community. Therefore, this section also addresses Goal 5 (Gender equality: "Gender equality is not only a fundamental human right, but a necessary foundation for a peaceful, prosperous and sustainable world.," Goal 8 (Decent Work and Economic Growth), Goal 16 (Peace, Justice and Strong Institutions: "Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels"), and Goal 17 (Partnerships for the Goals: "Revitalize the global partnership for sustainable development").

Infrastructure

Theme 10: Municipal transparency (maximum score - 4 points)

In addition to providing online services, a Smart City must also be transparent – i.e., the municipality must ensure that information on processes, means expended and results achieved are accessible to anyone interested. For example, there must be transparency about the municipal budget and essential municipal decisions in a way that reflects not only specific activities, but also the reasons for and the consequences of such decisions (except in cases where such disclosure would harm the privacy or safety of residents, such as, for example, information regarding populations with special needs). "Open Access" information such as this should be based on the 2007 principles of "open governance" and include **completeness** (all information except where privacy or confidentiality is compromised); **directness** (without rendering or filtering); **timely** (adjacent to the time when it was created); **accessibility** (for as many users and needs as possible); **online** (in a way that will allow automatic processing of the information); **egalitarian** (no registration required); open (unlimited format); and **free of license** (and copyright).

Accessibility to information not only increases transparency and consequently the public's desire to be a partner in the city's decision-making process; it also allows entrepreneurs to offer technological solutions to local needs based on real data.

Essence	Scoring properties	Max score	ln my town.
Access of information and municipal knowledge to the general public	 (a) Development of municipal public databases (open-access) that allow the public and stakeholders to view and analyze urban activities: both as information that is explained and highlighted for the benefit of the average citizen, and as raw data that will facilitate research and the performance of tasks by professional bodies. Accessible & explained information about the municipal budget plus info from three more municipal departments, 1 pt. Access to complete protocols of the city council and statutory committees, 1 pt. 	2	
	(b) Transparency in Internet and municipal information systems according to the "international transparency index " for municipal websites (for the current year) receiving a score of B, 1 pt.	2	
	Receiving a score of A or A+, 2 pts		



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Answers to UN's Sustainable Development Goal (SDG)no. 10: Reduced Inequalities: "To reduce inequalities, policies should be universal in principle, paying attention to the needs of disadvantaged and marginalized populations.") in cooperation with all stakeholders.

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In addition to this goal (and of course goal 11), this section improves accessibility and the relationship with different parts of the community and improves services to the community. Therefore, this section also addresses Goal 5 (Gender equality: "Gender equality is not only a fundamental human right, but a necessary foundation for a peaceful, prosperous and sustainable world.," Goal 8 (Decent Work and Economic Growth), Goal 16 (Peace, Justice and Strong Institutions: "Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels"), and Goal 17 (Partnerships for the Goals: "Revitalize the global partnership for sustainable development").

Infrastructure

Case study: Open information in the city of Los Angeles, California.

In 2013, six months after he was elected Mayor of Los Angeles, Eric Garcetti launched a website with 100 open databases in use by city officials, researchers and public activists. Half a year later, the city was ranked as the most digital city in the USA and in the following years won many awards with respect to the use, processing and display of information. Open

Strategy

Management

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Budget Home What's this?	\$3.03 Billion A Livable and S	Sustainable City 2019	•	
Expense Budget	Where's it Going? How's it Funded?			
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information became a principal strategy that allows citizens to be informed and involved in solving fundamental municipal challenges.

The information available continues to be upgraded in the city and today includes a central information system comprising more than 500 databases from 20 municipal departments, in five different formats:

- <u>LA's Open Data Portal.</u> The original system includes many databases at a basic level.
- <u>GeoHub.</u> A multi-subject geographic information system, it includes more than 40 different "apps." The system enables analysis of information resources through maps, texts, videos and maps (such as maps of sanitation map, construction, anticipated permits, pedestrian safety, accessibility to businesses, etc.).
- **Open Budget**. detailed information about proposed municipal budget (see photo above).
- The Mayor's Dashboard. up-to-date information on availability of municipal services.
- <u>Performance plan Dashboard</u> compliance with short- and long-term goals and the city's strategy for urban sustainability.
- In addition, the **city comptroller's office** extensive info on municipal expenditures.

Infrastructure

Innovation

http://data.lacity.org/ Mayor Garcetti introduces the systems: youtu.be/iuUShx8hsWQ]



Theme 11: Digital Engaging of the public (maximum score - 4 points)

Public participation in municipal decisions and has been going on for years, but the members of the public who tend to participate are usually professionals or those with specific concerns; the public at large tends to remain un-interested and disconnected.

A Smart City should use digital tools so as to involve all its inhabitants in its activities and in municipal decision-making.

In recent years, many cities worldwide have begun using digital tools such as social networks and dedicated websites to involve the public by sharing information and allowing them, alongside professionals, to become involved in various parts of the decision-making process. Usually, this occurs during the stages of formulating and/or collecting information. A Smart City must exploit a variety of tools – open-access databases, direct contact with citizens based on various population segmentation and interests, and even using gaming elements (Gamification) – to garner interest that will encourage cooperation.

It is important to ensure that the introduction of digital tools does not exclude residents that do not live in a digital environment due to economic hardship, "technophobia," the lack of digital knowledge (e.g., the elderly) or cultural reservations (for example cultural or religious restrictions). A Smart City will know how to provide a variety of alternative solutions to these populations through the use of information and feedback stands that are situated in public areas (such as an information kiosk), to provide instruction on the use of digital systems, providing information attendants or other creative solutions.

Essence	Scoring properties	Max score	In my town.
Public involvement and collaboration of city residents using digital tools	Urban policy that includes the use of digital tools to involve the public in decision-making on various issues, including online resident feedback that includes public participation in questioning, discussion and presentation of the deliverables (closing feedback loops). The policy should also include measures to include the voices of members of the population who are not connected to the network or skilled in the use of digital tools. An online public sharing process that has been used at least once in the past year, 2 pts. Digital collaboration tools that are accessible in the public sphere (e.g. information kinsk) 1 pt	4	
	A policy for online public participation, including implementation, training, and alternative accessibility for all sectors, 1 pt.		



Answers to UN's Sustainable Development Goal (SDG)no. 10: <u>Reduced</u> <u>inequalities</u>. *"Reduce inequality within and among countries."*

In addition to this goal (and of course goal 11), this section improves accessibility and the relationship with different parts of the community and

improves services to the community. Therefore, this section also addresses Goal 5 (Gender equality: "Gender equality is not only a fundamental human right, but a necessary foundation for a peaceful, prosperous and sustainable world.," Goal 8 (Decent Work and



Economic Growth), Goal 16 (Peace, Justice and Strong Institutions: "Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels"), and Goal 17 (Partnerships for the Goals: "Revitalize the global partnership for sustainable development").

Case study: The Block-by-Block public initiative for municipal planning using the "Minecraft" game

The housing organization of the United Nation joined the Mojang Company to develop the popular computer game, Minecraft, to enable the public who do not usually have a voice in planning their communities to become partners in planning the open spaces in their cities. As a result of the game, public participation in planning processes occurred in approximately 30 cities in 25 countries. In Haiti, a group of illiterate fishermen (certainly without computer drafting skills) used the program to visualize how their area could be rebuilt after being destroyed by flooding. In, Kibera in



Kenya – Africa's second-largest urban slum –residents used the software to resolve disputes over the use of a football field by enabling the paving of an adjacent access road.

http://blockbyblock.org



Part III: Construction, Sustainability and Smart Infrastructure

A Smart City is a resilient, sustainable city where it is good to live. The city is able to adequately respond to extreme situations and frequent changes and adapt without significant deterioration in the quality of life of its citizens.

A good city is. firstly, evaluated by the way it provides essential services to its citizens and inhabitants, including quality living space, health, safety and essential services to buildings and city spaces, especially with respect to energy, water, transportation and sanitation.

In addition, the city needs to provide full accessibility – both physical and digital– to services to meet the full gamut of residents' needs, including personal, cultural and social, for all sectors, genders, ages and socioeconomic levels. There is no doubt: the 21st century presents a daily challenge to the municipality to provide all that, especially in light of population growth, diminishing natural and open areas, and natural disasters. Therefore, **a Smart City must take on the role to change existing models so that the services it provides will be more effective, more collaborative and more sustainable**.

This part of the Index examines the planning, formation, management and operation of the urban infrastructure and city services, and their level of adaptation to improve sustainability, service orientation, resilience and equality – as based on the elements already discussed above in Part I (Urban Strategies for the Smart, Sustainable City) and Part II (Smart, Information-based Municipal Management)

Total in Part III: Six sections and 16 sub-sections. Possible score: **45 points**



Theme 12: Green and sustainable buildings and neighborhoods

(maximum score - 6 points)

Before introducing technological tools or other innovative measures to improve urban infrastructure and services, emphasis should be put on designing urban buildings and neighborhoods in an intelligent, sustainable way that allows better quality of life, smarter services management, and reduced resource consumption.

Proper initial planning can go a long way to encourage the use of infrastructure and resources and will reduce usage costs— this, much more than installing technological systems that try to improve them after the fact. A Smart City must first strive to design smart buildings and neighborhoods that meet the advanced criteria for being green and sustainable

In addition, local authorities must adopt and adapt both local and international standards to design better buildings and neighborhoods, with an aim to make structures and spaces more efficient in terms of energy and water, better in terms of health and quality of life, and more accessible to residents that have to frequent them in order to receive municipal services and resources.

A Smart City should strive to introduce sustainability not only in the newest neighborhoods but also (especially) to already existing public and residential areas, to introduce quality living and timely responses in both weak and strong neighborhoods. A Smart City must provide opportunities for sustainable building also in existing areas as an essential part of its maintenance, management and operation policies.

Essence	Scoring properties	Max score	In my town.
Quality in planning and administrating buildings and	(a) buildings designed according to accepted local or international green building standards to ensure sustainability in the planning and implementation stages	2	
neighborhoods in the context of	15% of annual permits meet the green building standard threshold, 1 pt. 1% of buildings with 4-5-star green building standard, 1 pt.		
sustainability and efficient resource management	(b) Official city policy designed to improve sustainability in buildings and public spaces <u>in existing</u> neighborhoods.	2	
	Planning and approval of an applicable urban policy, 1 pt. Implementation of the policy in at least one neighborhood, 1 pt.		
	(c) A sustainability program for a new neighborhood that meets the standard for sustainable neighborhoods ("Neighborhood 360") or similar accredited international index	2	
	Statutory plan (in at least the advanced planning stages) that is compatible with the above-mentioned standard or those of a recognized international organization, such as LEED or BREEAM, 2 pts.		



Answers to UN's Sustainable Development Goal (SDG)no. 13: <u>Climate Action</u>: "Take urgent action to combat climate change and its impacts." In addition to this goal (and of course goal 11) this section optimizes resource management, improves welfare and public health and lowers the cost of living.

Therefore, this section also addresses Goal 1 (No Poverty), Goal 3 (Good Health and Wellbeing), 6 (Clean Water and Sanitation), Goal 7 (Affordable and Clean Energy), 9 (Industry, Innovation and Infrastructure)), 12 (Responsible Consumption and Production) and Goal 15 (Life on Land).



Theme 13: <u>Accommodation for all</u> (max. score for this section - 2 bonus points)

A Smart City needs to provide solutions for major urban challenges. Since housing is one of the main challenges to City Hall in most cities around the world,-a Smart City must be able to deliver solutions in this area.

Innovation in this case is not necessarily technological. It can also be a process, concept or regulatory innovation that will bring about changes in a variety of ways. These include changes in demand due to modified living/habitat patterns (e.g. moving from a large to a small apartment), in economic models (encouraging long-term rental), in building criteria (apartments geared to students, seniors and others and where the services and configurations are tailored to the target audience). The result will be improved housing quality, accelerated building rates and reduced costs due to innovation in construction (new methods or innovative materials), streamlined administrative processes or quality control (beyond legislative requirements), and housing benefits or subsidies to eligible target audiences.

Using digital tools can help solve the housing crisis in several ways: gathering information to understand housing needs (who is looking for an apartment, how many people in a family, what is their personal profile), facilitating the search for apartments adapted to specific needs, administration of condominiums and real estate, and even creating housing models for cooperative housing or shared work spaces (which can increase the availability of residential and work areas and reduce user costs).

Essence	Scoring properties	Max score	In my town.
Innovative initiatives to meet the housing needs for all city inhabitants	 Innovative urban procedural strategies and activities (physical and/or digital) with respect to licensing, construction and housing strategies that will improve accessibility to housing and reduce the deficiency of residential units, bureaucracy in housing matters and housing costs, etc. 1 pt. for each official initiative of the city/municipality (max 2 points) Since most cities are still not using the point scoring method, this score is in addition to point the way in the future for the parameters to follow. 	2	



Answers to UN's Sustainable Development Goal (SDG)no. 10: <u>Reduced</u> <u>inequalities</u>. *"Reduce inequality within and among countries."*

In addition to this goal (and of course goal 11), this section addresses the basic need of housing for all, and therefore also addresses Goal 1 (No Poverty), Goal 3 (Good Health and Well-being), Goal 9 (Industry, Innovation and Infrastructure) and goal 15 (Life on Land).



Case study: Innovative Housing Lab of Boston

In 2014, as a result of the housing crisis in the city, Boston city hall published a housing strategy to 2030. As part of the plan, the mayor established a Housing Innovation Lab based on the New Urban Mechanics program (see case study in section 5, above). The team introduced a brainstorming initiative for acceptable solutions that included the public and all stakeholders. The result was a variety of pilot projects and initiatives. One of these was the "Urban Housing Unit (UHU) Road show" where a 1:1 scale model of a smaller-sized apartment was driven through neighborhoods where the apartments that had been mapped out were thought to be



too large after considering the residents' profiles. The 1:1 model demonstrated the potential quality of life in a smaller, modular apartment. Some other projects were "Home sharing Pilot," a municipal portal which helped students to find spare rooms for rent in the homes of elderly residents, thereby providing affordable housing to the students, and extra income and companionship to the elderly; "Density Bonus Pilot" which gives developers incentives in exchange for more affordable units; a "Housing Innovation Competition," which asks the public for proposals for innovative housing solutions for the city; and the development of a more efficient online process to reduce bureaucracy when purchasing apartments.

http://www.boston.gov/departments/new-urban-mechanics/housing-innovation-lab





Theme 14: Public health and quality of life (maximum score - 4 points)

A Smart City that is not working to improve public health and welfare is missing the point of its existence. The technological revolution brings with it also loneliness, alienation, and health challenges as a result of crowding (more exposure to infection), the psychological effects of the online world, and socio-economic marginalization that widens the gap in accessibility to advanced medicine. The goal of a Smart City must also include dealing with such issues.

Technological tools should be utilized on the one hand to make medical services more accessible (such as remote medicine, personal monitoring for populations at risk, and digital methods for managing medicine and community health mobility) and, on the other, to reduce problems by encouraging residents to get out into the public spaces to socialize and engage in physical activity (for example, by using interactive installations or game apps that encourage activity, such as the Pokémon-Go game that lured thousands out of their homes). In addition, technology can be a tool for improving mental health and well-being through the construction and maintenance of specialized social networks that connect the digital world and the physical world, such as social networks for athletes, or a network to coordinate get-togethers about topics of interest that will encourage social interaction with strangers. Similar digital "matchmaker" tools can also be utilized to connect young people and seniors who share similar interests, leading to a dramatic improvement in the well-being of the elderly in the city, at the same time monitoring the citizens to ensure personal safety.

The issue of health and welfare also links age with the physical environment, because people of specific ages (babies and the elderly) may be more exposed to pollution-based health issues in certain areas of the city (along main thoroughfares or near industrial areas). A Smart City will respond to such issues by mapping and identifying sensitive areas and populations, monitoring and measuring these areas as part of the preliminary preparation, and then initiating actions to reduce hazards according to priority, and rerouting residents' activities to locations and times associated with lower risk, thus enabling the residents to cope with potential risks.

Essence	Scoring properties	Max score	In my town.
Preparation and application of urban strategies and actions for improving public health and well- being	 (a) Municipal initiatives for improving public welfare, well-being and health including information or technology 	2	
	• Design and construction of applicable municipal initiatives, 1 pt. per project, max. 2 pts.		
	(b) Installing sensors and urban monitoring to measure noise and various pollutants in sensitive areas of the city		
	 Installation of sensory and monitoring measures in at least one sensitive zone, 1 pt. Making the information accessible to the public on the city website 	2	
	or on social networking. 1 pt.		

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≻Answers to UN's Sustainable Development Goal (SDG)no. 3: <u>Good Health and Well-being:</u> *"Ensure healthy lives and promote well-being for all at all ages."*

In addition to this goal (and of course goal 11) this section improves the quality of life, environmental justice and preparedness for climate change and

therefore also addresses Goal 5 (Gender Equality), Goal 10 (Reduced Inequalities), Goal 13 (Climate Action), 15 (Life on Land) and Goal 16 (Peace, Justice and Strong Institutions).

Case study 1: Online mental health: BIG WHITE WALL—UK, Canada and New Zealand

An innovative British startup, in collaboration with the National Health Service, developed a digital portal that provides round-the-clock mental health support anonymity. It allows its users to remain anonymous, while providing assistance from community members with similar issues (for free) or from experts (after contacting proper health services). There is also an option join self-improvement courses through the site. This kind of service is particularly suitable for those who are afraid to identify themselves or who do not want to wait for regular office hours.

At present there are severe shortages in practicing doctors and medical personal as well as budget cutbacks. Thus, this type of solution offers a complementary, and sometimes even a prominent, form of service. Local authorities around the world are considering similar forms of well-being solutions to strengthen their health and social welfare services and to provide another link in the health care chain in the community, particularly to solve the challenge of loneliness. It began as a service offered by companies, universities or other organizations (such as the military). In October 2018, the Province of Ontario, Canada adopted this portal as a way to provide an extra layer of mental health services. The portal is monitored by national health agencies around the clock.

www.bigwhitewall.com

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Case study 2: WAYFINDER LIVE – an outdoors game-based activity in Dublin, Ireland and Melbourne, Australia

The game is designed using augmented reality to get people to move around and discover their city while playing a game. The interface is based on physical objects throughout city neighborhoods that become animated when watching them via the mobile phone. They change on the screen to give clues that will help the user perform tasks on the way to victory. http://ludea.net/wayfinderlive



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Case study 3: The city-wide sensor network of Chicago -- Array of Things (AoT)

This initiative is a trial urban sensing project set up by the City of Chicago in cooperation with University of Chicago and others. It is based on a network of 500 interactive modular sensor "nodes" that are installed around the city to collect real-time data on the environment, infrastructure and activities for the benefit of research and decision making on public use. AoT is actually the city's "fitness tracker," measuring factors that can affect city life such as climate, air quality and noise. In the first stage, a dense network of sensors was installed in downtown Chicago in 2016. The number was raised to 500 by 2018.



The system helps to better understand how the city works and how to properly regulate and deal with various environmental issues. The information on the site is freely accessible for the benefit of start-up companies and scientists who can propose solutions, and for the general public so they can deal with cases of extreme phenomena such as flooding, serious pollution and more. The site also includes a comprehensive interface for medical monitoring applications (such as an allergies or asthma monitoring system).

http://arrayofthings.github.io



Theme 15: Smart and sustainable physical infrastructures

(maximum score - 9 points)

Strategy

Management

Central to many Smart City projects worldwide are the monitoring and control of urban infrastructures, either via controls and sensors on the infrastructure's lines or via meters adjacent to residential units. However, a Smart City should not rely only on the infrastructure's managers: it must ensure that the information is accessible to the public and even assist them to act based on this information.

As an example, installation of efficient light and energy systems will not only reduce the load on the municipal budget, it can also lessen negative effects caused by light pollution as a result of too much lighting in places and at times where it is not necessary (for example, during a full moon or alongside a road with little traffic).

Therefore, the installation of smart energy and water systems includes putting in control measures that will allow dynamic management during operation and that can be used as a principal tool for optimizing management and budget. A Smart City should also rethink the issue of management of the urban infrastructure.

But the challenge does not end with the installation of efficient systems. A Smart City also needs to work on changing modes of consumption so that the consumers share the responsibility of facilitating flexibility and innovation in the supply and demand for services in the Smart City.

There are already many examples of cities and neighborhoods where energy consumers are also producers. Such infrastructures are sometimes organized in independent or semi-independent production or consumption networks called microgrids. Control measures are erected that can separate the microgrid from the main city grid when there is a power outage or when local energy production is preferred over the purchase of energy from the power companies. Such initiatives can bring about significant change – both by increasing the network's durability and by increasing individual and community motivation to reduce consumption or to shift power demand to hours when there is less pressure on the system (this model is sometimes called a "virtual power station").

Microgrids are proving to be the newest trend worldwide. Nevertheless, local regulations may have not yet been fully adapted to implement this concept, therefore, scoring at this stage will be allowed based on controlled trials or a municipal policy that is geared for the formation of such projects in the future.

Essence	Scoring properties	Max score	ln my town.
Innovation, sustainability and cooperation in local infrastructure management	(a) A network of smart solutions to measure and monitor municipal infrastructures (water and energy) with the information and data accessible to all residents of the building or neighborhood.		
	Installation of sensing and monitoring equipment on municipal infrastructure systems and sharing public information (this is in addition to individual information) regarding consumption and efficiency on the building, city block or neighborhood levels so as to encourage a reduction in demands and an increase in personal responsibility. 2 nts	2	
	 (b) Installing measures to improve the efficiency of \ energy and lighting systems in public spaces, including detectors and smart meters that 	4	

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respond to changes in usage patterns or climate, or moderate usage in different areas. Installation of a significant amount of smart lighting and/ or efficient energy systems in open urban areas (e.g., an entire neighborhood, or a particular area of the city, such as the city center or an industrial area), 1 pt. Installation of smart energy systems in public buildings and/or some other significant municipal space, 1 pt. (c) Municipal initiatives to include consumers in infrastructure management, such as local infrastructure planning (microgrids) for energy or water systems Official strategic plan or masterplan for a neighborhood or city area, enabling a community-based infrastructure /microgrid network, 2 pts. Implementation of a microgrid / community-based infrastructure. 2 pts.



Strategy

Management

Answers to UN's Sustainable Development Goal (SDG)no. 12: <u>Responsible</u> <u>Consumption and Production</u>: *"Ensure sustainable consumption and production patterns."*

In addition to this goal (and of course goal 11), this section reduces the cost of living and is based on based on the urban infrastructure, and therefore also addresses Goal 1 (No Poverty), Goal 6 (Clean Water and Sanitation), Goal 7 (Affordable and Clean Energy), Goal 9 (Industry, Innovation and Infrastructure) and Goal 17 (Partnerships for the Goals).

Case study 1: Energy data management and presentation at Weber University, Ogden, Utah, USA (a case study of subsection a.)

Weber State University, which has about 25,000 students, announced its attention to be carbon-free by 2050. To this purpose, it intends to dramatically reduce its energy consumption and to move over to alternative fuels. In the framework of this transition, it integrated an energy management system that included installing monitors in all the campus buildings and forming an interactive portal to manage energy, water, heating and cooling so as to be able to identify problems and overuse of resources. No less important, its aim was to lead to a behavioral change within the community of consumers.

The system is open to the public, and accessible through the university's website and via touchscreens located throughout the campus. It includes the option of observing real-time consumption; comparing daily, weekly or monthly consumption levels; or comparing consumptions patters of different buildings on campus. It offers competitions between campus buildings and tips to improve (reduce) consumption in buildings.

This system, which has also been installed in various other universities throughout the United States, has in this case led to a 30% reduction in electricity costs in two years.

Infrastructure

An academic campus is really a small town, and even though the "consumers" are not paying for the goods (and therefore the challenge to encourage compliance is greater than with paying consumers), the behavioral modification was a result of how the information was presented and the instillation of a sense of partnership and responsibility.

Innovation

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www.weber.edu/sustainability/LucidDashboard.html

Case study 2: Micro-grid in Brooklyn, New York (a case study for subsection c)

In the wake of the massive blackouts caused by hurricane Sandy over entire sections of the East Coast of the US in 2012, the governor of New York declared a competition calling for pilot projects, funded by the state, that would experiment with introducing local energy networks (microgrids) -- local networks for the production and consumption of energy that can be disconnected from the general power grid (provided they are connected) and



transfer to locally produced energy (mostly by renewable energy sources) so that the power supply is not affected as a result of network failure.

The LOS3 Company joined SIEMENS and proposed establishing an electrical grid in the heart of Brooklyn that would be centered on solar energy production on the roofs of buildings and the sale of surplus to residents of neighboring communities. The system is managed by a residents' cooperative (alongside the infrastructure company). The uniqueness of the project is the "energy trading" that occurs directly between the owners of the rooftops and the other residents, without any need for a 3rd party intermediary. The process allows direct (peer-to-peer) communication between parties using "blockchain" technology (the technology behind Bitcoin), which allows digital registration and, of course, all monetary and energy-related transactions. After negotiations between the parties on quantities and prices, the system performs all transfers with full security. The network is still in its infancy, but it allows anyone with access to a roof to become an energy-production business that generates income from reducing their own consumption to have more to sell to others, thus encouraging expansion of production, reducing the cost of living, and improving resiliency and sustainability of the power grid.

Similar models are being tested today successfully elsewhere in the world: on campuses and in towns and villages.

http://www.brooklyn.energy



Theme 16: Effective and demand-based municipal services (maximum

47

score for section - 14 pts.)

Strategy

Management

The worldwide growth rate of cities and the rising demand for infrastructure and services have produced an increasingly widening gap between the demand and supply of urban infrastructure and services.

The gap stems, among other things, from the fact that programs and services are usually based on "average statistics" or some quantification that is irrelevant for the population in question (for example, building schools or planning water and electricity systems in a new neighborhood based on data geared to the secular community whereas most of the families that have purchased housing units are ultra-orthodox with their associated higher per-family size; roadwork design based on the average number of cars per family, where in actuality, most of the families are young couples or lower income families, who own fewer vehicles but requiring better public transportation but fewer parking spaces.

While one approach sees the Smart City is a tool for more effective service management (such as stoplight management, managing queues or parking management), research has shown that expanding and "improving" the infrastructure does not necessarily lead to an improvement in service. Rather, it leads to ever-increasing demands on the infrastructure. For example, while adding traffic lanes or coordinated traffic lights might seem like something that would reduce road congestion, in fact, the better infrastructures just increase motivation to use a car. Thus, a Smart City must act to change and stabilize consumption patterns through an outreach information program that will encourage cooperation and create conditions that change the trends instead of increasing demand. For example, by making information about personal or community rates of energy and water consumption, alongside information regarding analysis of the personal or community potential to change demands accessible to citizens, consumption can be reduced by nearly 10%. As another example, making information accessible and creating a dialogue between the citizens, the municipality and the transport companies together with a relevant municipal policy that improves accessibility in terms of time and station location, may increase confidence in the system and lead to a desire to move from private vehicles to public transport. Including the community in formulating the security policy is likely to increase their sense of security. In many cases, it may replace the need for cameras and cost-intensive security systems.

This section encourages the promotion of initiatives in these areas, but also takes into account the formation of policy that allows and directs municipal activity -- including making the solutions and initiatives accessible to all the citizens and areas of the city.

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Essence	Scoring properties	Max score	My index score
Municipal actions to streamline the use of resources and improve services to citizens, with an emphasis on cooperation and changing consumer trends	 (a) Municipal initiatives to increase the motivation of citizens and communities to change the nature and extent of demand for services, resources, or municipal infrastructures (e.g., through supply of information, personal or community reinforcement, cooperatives, etc.), Initiative or policy approved by city council, 1 pt. Application of the initiative, 2 pts. 	3	
	(b) Smart policy to streamline traffic and parking in the city, with an emphasis on reducing private driving and encouraging the use of public transport or cooperative driving,	3	
	Initiative or policy approved by city council, 1 pt.Application of the initiative, 2 pts.(c) Smart policies for improving personal security throughout the city or		
	in key areas. Initiative or policy approved by the city council, 1 pt. Application of the initiative, 2 pts.	3	
	d. Smart urban policies to streamline and reduce waste in the city. Initiative or policy approved by city council, 1 pt.	3	
	Application of the initiative, 2 pts, e. Promoting local initiatives for improving and optimizing the use of	2	
	open urban spaces with an emphasis on multi-generational use. Implementation of technological measures to improve and optimize the use of public spaces, 1 pt. per project, max. 2 pts.	Z	



Answers to UN's Sustainable Development Goal (SDG)no. 12: <u>Responsible</u> <u>Consumption and Production</u>: *"Ensure sustainable consumption and production patterns."*

In addition to this goal (and of course goal 11) this section reduces the cost of living based on improving urban infrastructure, and therefore also addresses Goal 1 (No Poverty), Goal 6 (Clean Water and Sanitation), Goal 7 (Affordable and Clean Energy), Goal 9 (Industry, Innovation and Infrastructure), and Goal 17 (Partnerships for the Goals).



Case study 1: Behavioral change campaign to reduce energy consumption in Worcester, Massachusetts, USA

The National Grid energy company initiated a widespread project geared to change behavior in energy consumption. The project included a publicity campaign tailored to the power consumption pattern of each consumer, the distribution of tools for measuring consumption and usage management, a "game" to increase efficiency presented as a competition among neighbors, establishment of training centers in towns, and a monthly electric bill that illustrates not only the individual household's



usage, but also their usage compared to 100 houses in the area. The project started with 50,000 consumers, but as a result of their satisfaction and an average reduction of 17% in energy consumption, it was released to all the consumer public.

http://www.worcestersmart.com

Case study 2: Citymapper – An app aimed to encourage the use of public transportation in London

The Citymapper app is a travel management application that suggests routes and transportation methods based on destination, time and personal preference. The information gathered during the development pointed to discrepancies between the frequency and areas relating to public transport and local need, leading to an initiative to introduce city shuttles that allows those with the app to virtually suggest the positions of stations along the regular

travel route, instead of having to walk to an existing station. At the same time, the company initiated a similar service for taxis ("Black Cabs") for those who do not wish to travel on crowded buses – also based on a fixed route. These initiatives provide an alternative to the available public transportation in the city, thus encouraging residents who had until then opted to use private vehicle to switch to public transport. The company works with together with the municipality; it does not come to replace them. The initiative leads to transportation upgrades based on data at a faster rate than most cities in the world. Worldwide, cites are just beginning to discover similar solutions, financed or initiated by the local authorities, so as to shorten travel times by eliminating fixed stations that can dramatically lengthen the trip – and remaking them into stations "on order."

http://citymapper.com/smartride

Strategy

Management



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Case study 3: Saftipin – The wisdom of crowds to produce and make accessible information on personal safety for women in India

Against the backdrop of severe violence against women in India, an application was developed that allows verifying the security of an area based on nine parameters (Lighting, Openness, Visibility, Crowd, Security, Walk path, Availability of Public Transport, Gender Diversity and Feeling) that are clearly presented on the app or webpage. The information is collected through observation in the field



– including photography by volunteers and community members and information from various authorities. The system is aimed at cities and their inhabitants and includes additional data to improve personal security within the municipality, including mobilizing the business community to add their businesses on the "safe map for women," offering more information to authorities, algorithms that propose safe routes for those requiring it, and a system for tracking personal security. The system has recently been expanded to other cities in Asia, South America and Africa.

http://safetipin.com



Theme 17: Digital infrastructure for everyone (maximum score - 6 points.)

The basis of a significant portion of online services is an extensive and reliable city ICT network city, including an open wireless network. But a communication network is not the goal in itself. Installing such a network must aim to provide for real needs, reduce gaps and ensure that communication is accessible in the places that is required most.

Therefore, a Smarty City must set up an ICT network that will, first and foremost, support goals such as promoting sustainability, resilience and equality. This network will encourage using public buildings or open spaces and will provide services to residents in the public sphere (such as more information to citizens or tourists).

The infrastructure and Digital Services must be accessible to all members of the public, and support also those in disadvantaged neighborhoods or needy populations (for free or subsidized) -- alongside focus points of economic growth.

Essence	Scoring properties	Max score	My index score
Broadband Internet and communications available for all populations in the city.	a. An initiative to provide free open web in major urban public areas (schools, libraries, clinics, open spaces such as public squares and parks, etc.) for general use and without the need to register in advance	2	
	Strategy and implementation of broadband Internet access in public buildings in the city, 1 pt. Broadband Internet access open for public use in open public areas, 1 pt.		
	 b. Urban strategy to implement broadband Internet in strategic areas in the city, such as disadvantaged neighborhoods or near subsidized populations 		
	A systematic urban plan to deploy high-speed broadband Internet in strategic areas, which is approved and budgeted by the city, 2 pts. provision of free or subsidized high-speed Internet access to challenged communities 2 pts.		



Answers to UN's Sustainable Development Goal (SDG)no. 10: **<u>Reduced</u>** <u>inequalities</u>. *"Reduce inequality within and among countries."*

In addition to this goal (and of course goal 11) this section reduces cost of living based on improved urban infrastructure, and therefore also addresses

Goal 1 (No Poverty), Goal 6 (Clean Water and Sanitation), Goal 7 (Affordable and Clean Energy), Goal 9 (Industry, Innovation and Infrastructure) and Goal 17 (Partnerships for the Goals).



Case study: All-accessible Wi-Fi strategy for the city of Seattle, Washington

The city of Seattle has prepared a strategic plan to promote access to broadband communication throughout the city, to enable cooperation between private and public sectors, to examine approaches for financing public Internet in order to reduce bureaucratic barriers, and to promote "digital justice." The plan introduced public Internet that is accessible to all in 12 underprivileged neighborhoods and six parks. This was made possible through a private-public partnership and, according to models, promises to both reduce the digital gap and also create a



sustainable economic model. The document includes a minimum service level to ensure proper distribution of service and quality communication that will allow the transfer of content according to the needs of the users.

http://www.ctcnet.us/publications/city-of-seattle-plan-for-facilitating-equitable-access-to-wireless-broadband-services/



Part IV: Innovation, Education and the Local Economy

A Smart City implements innovation to enable a sustainable economy among its residents and directors. It striving to resolve problems by engaging local business and developers.

A Smart City is not only a city that strives to utilize smart information systems and technologies: it also harnesses innovation to respond to local challenges and encourage consistent economic growth.

In a Smart City, the words "innovation" and "urban" combine to express urban activity that enhances the local economy, and balances sustainability and social equality with local economic growth. There is an emphasis on local businesses and entrepreneurs who work together to solve the needs and challenges of the city.

Urban innovation such as this must also include the following: a policy for educational innovation that promotes digital literacy and educational excellence and that reduces the digital gaps between communities and sectors; cooperation between city stakeholders, including research and academia; citizen feedback with respect to pilot programs for technological solutions before their broader application; systematic policies to promote quality local economy (especially for small and medium enterprises), which includes amalgamating the employment sectors, regulatory and financial aid tools, and the implementation of supporting digital tools.

Total in Part IV:

4 sections and 10 subsections. Possible score: 20 points.



Theme 18: Education and digital literacy (maximum score - 4 points)

The complexities of the city, society and employment in the 21st century requires of its citizens to possess skills that are different from those of previous generations: digital literacy, teamwork and interpersonal communication, collaboration, independent learning, curiosity and entrepreneurship, critical thinking, the ability to cope with complex problems, and more.

A Smart City should not only prepare its young generation for the future but should educate all active members of society for life in the 21st century, so that they will not miss opportunities that exist in the present and those that will appear in the future.

Also, city employees and managers should have the skills to accommodate changes both in city government and in the demands and capabilities of the public. For example, children can learn to code, to think outside the box and to work in groups, while learning also about ethics and morals. The unemployed must be taught how to apply for a job or municipal support measures online, or how to optimally search for work via the Internet. Municipal workers will learn how to transform routine processes into digital processes and how to use digital tools to streamline work and collaborate with other organizations or learn how to check and test technological products in the municipal venue.

Essence	Scoring properties	Max score	ln my town.
Multi-generational education and training for 21 st century skills	(a) An official urban action plan to provide 21 st century digital literacy and skills to children (formal education) and citizens from various sectors and ages (informal frameworks)	2	
	Official curricula for training students in 21 st century skills, 1 pt. Training programs in innovation and digital literacy for various communities and groups, 1 pt.		
	(b) Placement and training programs for municipal employees in the fields of innovation and digitization that have been adapted to the needs and means of the authority	2	
	Municipal training programs or the participation of <u>at least</u> two managers in training programs on the subject of urban innovation and digital transformation, 2 pts.		



Answers to UN's Sustainable Development Goal (SDG)no. 4: <u>Quality</u> <u>Education</u>: "Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all."

In addition to this goal (and of course goal 11), this section narrows the gaps in employment potential and promotes innovative employment opportunities, and thus addresses Goal 1 (No Poverty), Goal 8 (Decent Work and Economic Growth), Goal 9 (Industry, Innovation and Infrastructure), Goal 10 (Reduced Inequalities



Case study: Bullis School, California – A public elementary school in the Silicon Valley

This project was based on assimilating innovation and technology in all learning topics and also including collaboration with industry, learning about entrepreneurship, creative thinking, risk-taking and learning from mistakes. The school has an "innovation laboratory" and FABLABS, age-integrated and multi-topic classes and offers topical studies (including Chinese as a global language). The school is considered one of the most innovative public schools in the United States.



http://bullischarterschool.com



Theme 19: Educational excellence (maximum score - 4 points)

A Smart City emerges when the ideas, actions and accomplishments in the realm of enhanced sustainability, quality of life and urban economy are multi-sectored, span all ages and includes top-down initiatives (from the city) and bottom-up (from the public) activities.

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A Smart City must promote the active involvement of young people and the general public in dealing with city challenges – both through skills training and by creating innovative platforms that address city challenges in educational institutions, while at the same time including parents and other urban stakeholders in the initiatives. For example, in-school courses that address specific skills and teach about innovative tools (future trends that will expand into the areas of technology, society and science beyond the standard curricula); after-school activities in which educators and other community members cooperate to encourage intergenerational brainstorming for city-related issues, and more; courses on innovation and the environment or entrepreneurship such as "Young Entrepreneurs" or "UNIstream," which have been modified to address local urban challenges and not just for the sake of "simply" demonstrating entrepreneurship for its own sake.

In addition, a Smart City needs to know how to harness the information agencies in the city and to deal together with the challenges that affect the city and society. Many cities generate dialogues with social and economic bodies, but a Smart City should collaborate with research and development institutions – in both academia and industry – to examine, critique, develop and monitor activities and urban challenges, and even develop together innovative products to cope with these challenges.

Essence	Scoring properties	Max score	ln my town.
Promoting educational and professional excellence in the fields of science or society, aimed to address urban and environmental challenges	(a) Encouraging initiatives in school and throughout the city with an aim to educational excellence and with an emphasis on science and society aimed at tackling local challenges	2	
	Projects for educational excellence and innovation in 10% of the city's schools, 1 pt. Projects for educational excellence and innovation in 20% of the city's schools, 1 pt.		
	(b) Formal cooperation between the municipality and academic institutions and research bodies, to promote treatment, control or implementation of innovative solutions to local problems.	2	
	An agreement of cooperation or the appointment of representatives of academic institutions and research bodies to local municipal thinking and strategy forums to respond to local challenges, 2 pts.		



Strategy

Management

Answers to UN's Sustainable Development Goal (SDG)no. 9: Industry, Innovation and Infrastructure: "Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation."

Innovation

City Index 2018

In addition to this goal (and of course goal 11), this section promotes good governance and provides a response to challenges through partnerships, and therefore also addresses Goal 1 (No Poverty), Goal 8 (Decent Work and Economic Growth), Goal 13 (Climate Action) and Goal 17 (Partnerships for the Goals).

Infrastructure

Case study: The METROLAB Network -- Collaboration between cities and higher-level education pertaining to smart cities

MetroLab is an American network of more than 35 academia-city partnerships (44 cities, five counties and 59 universities) that focus on information gathering, analysis and innovative solutions to



urban challenges. The network enlists researchers to collaborate with policy makers in the cities for the purpose of carrying out research and development projects and to deliver solutions to upgrade infrastructure, public services and the sustainability of the cities. The network was launched as part of the "smart cities initiative" of the White House in September 2015.

http://metrolabnetwork.org/projects





Theme 20: Urban innovation (maximum score - 4 points)

A Smart City must harness its economy and its human resources to cope with the challenges it faces. Cities aspiring to be smart or to attract human capital, commonly establish development centers or try to entice innovative companies to the city. But this is not enough, because increased city tax revenues from such business does not make it smart or innovative. A Smart City must create a mantle of innovation that is expressed in the creation of knowledge, development and experience in the relevant fields in the city and the challenges it poses. Such focus can lead to cooperative thinking and the creation of new solutions to existing problems. To these ends, a Smart City must provide a broad mantle to develop initiatives and to control smart technological solutions for its challenges, including a physical space for companies and entrepreneurs; a facility for community feedback (from those who live with the problem and will experience the solution); policy tools to encourage technological experimentation and to focus the economy and innovation on local challenges and the inclusion of relevant companies and entrepreneurs.

Essence	Scoring properties	Max score	In my town.
Urban policies to encourage technological development with an emphasis on local expertise	a. The existence of a physical space to promote municipal-technological innovation that is owned by the city or that formally works alongside, which includes an urban innovation lab for research and demonstrations (living lab), or incentives for urban technologies		
	 Physical space owned, used or officially shared by the city, in which the activities that take place in it include technological development, demonstration, feedback or research related to the city's challenges, 2 pts. NOTE: An innovation space that does not address the city's technological challenges will not score points 	2	
	(b) City policy that allows regulated technological experimentation (at a location that does not require a building permit) or financial and organizational assistance tool		
	 Official policy that allows and promotes technological experience in the city, or an approved and budgeted policy to give financial incentives to developers, 1 pt. 	1	
	(c) Urban policy and official branding that focuses on employment, entrepreneurship and innovation processes in the city with respect to a defined municipal issue or urban challenge	1	
	 Approved and publicized policy that focuses on resources and attention from the city to the economy and on innovation surrounding one or more local challenges, 1 pt. 		



Strategy

Answers to UN's Sustainable Development Goal (SDG)no. 9: Industry,

Innovation and Infrastructure: "Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation."

In addition to this goal (and of course goal 11), this section helps the economy and responding to environmental challenges, and therefore also addresses Goal 8 (Decent Work and Economic Growth), Goal 13 (Climate Action) and Goal 17 (Partnerships for the Goals).



Case study: INNOZ – The center for transportation innovation and social change in Berlin, Germany

INNOZ is located in the Berlin city center in the Berlin Center for the Study of the Future City. It joins together end users and researchers to develop and try out prototypes in real terms and convey the findings to partners and stakeholders. The center includes an R&D department, a center for community experience (LIVINGLAB), and a training center for the public,



municipalities and researchers. It focuses mainly on issues of energy and transport, including setting up a smart energy grid and smart cars.

http://www.innoz.de/en





Theme 21: Smart urban economics (maximum score for section - 8 points)

A Smart City must promote its own local economy and nurture the small and medium businesses operating within it, which provide a central driving force of local growth. While large companies can promote efficiency or innovation processes in order to improve their marketing, business development and attractiveness, small and medium businesses -- including community initiatives – generally lack such resources and capabilities.

A Smart City must therefore work to economically support local businesses by encouraging their involvement in innovative programs that offer marketing channels and developmental support as part of its Smart City economy. This can include offering support, assistance, or funding in the establishment of digital platforms or **promoting initiatives for economic cooperation** that will reduce the costs and risks to local businesses (e.g., shared transport of products, shared tools, shared storage opportunities, creating complementary products via digital connection between local businesses). At the same time, the city should encourage similar economic enterprises that arise in the community, with the aim to improve sustainability and quality of life while at the same time reducing the cost of living. The municipality can promote local currencies to encourage residents, business and the city to first consume local products.

Essence	Scoring properties	Max score	My city index
Encouraging and developing innovation and smart tools to improve urban growth with an emphasis on small and medium businesses and a cooperative economy that will ease the cost of living of its residents.	 (a) An approved and budgeted city plan that supports innovative or technological processes with an emphasis on small- and medium- sized businesses operating in the city An approved and budgeted policy run by a specific body (existing or 	2	
	new) to support innovation among local businesses or resident entrepreneurs, including professional accompaniment, subsidized services, grants or loans, 2 pts.		
	(b) Construction or accessibility of municipal digital tools that can support local businesses in terms of visibility, marketing or partnership	2	
	Development and/or preparation of policy with respect to digital access of the local businesses, 1 pt. Proven use of a technological application to promote business in the city, 1 pt.		
	(c) Urban assistance for community initiatives that encourage a cooperative economy (such as shared offices, city assets, transportation, storage, services and facilities) that allow better business efficiency, improve quality of life or reduce the cost of living for residents and businesses.	4	
	Documentation of the projects, 1 pt. per project (max. 4 projects).		



Answers to UN's Sustainable Development Goal (SDG)no. 9: Industry, Innovation and Infrastructure: "Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation."

In addition to this goal (and of course goal 11), this section helps the local

economy and thus addresses Goal 8 (Decent Work and Economic Growth), Goal 13 (Climate Action) and Goal 17 (Partnerships for the Goals).



Case study: "Digital" Main Street in Toronto, Ontario, Canada

The city of Toronto has initiated a platform to support local businesses and to connect them to the digital world, in cooperation with trade unions and other partners. By 2018, approximately 200 companies received advice, training and support and have been outfitted with tools for digital commerce, connections to startups, digital presence and social networking for the companies.



http://www.digitalmainstreet.ca/

