TOP 50

SMART CITY GOVERNMENTS

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INTRODUCTION

Over half of the planet now lives in cities, and more than two-thirds of the world's population will be urbanized by 2050. Cities are pro-actively working across borders to build coalition networks and resist nationalist policies. They contribute to four-fifths of global GDP, and are taking center stage in securing an inclusive, safe, productive, sustainable, and resilient future for humanity.

Smart Cities have emerged as urban ecosystems that integrate digital technology, knowledge, and assets to become more responsive to users, improve city services, and make cities more loveable. Leading the development and re-invigoration of effective, high-performing cities is one of the grandest challenges of our time.

Much of the existing literature on smart cities focuses on how far each city has come and the resulting benefits. This may not offer adequate guidance to city leaders on what they should do, when each city operates in such a unique context. City planners require forward-looking and practical comparisons and guides, by understanding the budgets, infrastructure, policies, services, and innovative governance and resourcing models of different cities.

Beyond a set of rankings, this collection of the Top 50 Smart City Governments therefore details the development of smart cities from a city government's perspective. It identifies a suite of 10 key tools that mayors have found effective to develop smart cities, details our reflections on how these tools were applied differently to achieve a range of outcomes, and highlights the achievements of 50 leading governments that have steered their smart cities forward.

There is rarely a complete, universal recipe of what a government should do to make its city smart; each city works through a different "Theory of Change". Governance often involves a balance between attending to a context-dependent market failure, and stepping back before creating a market distortion.

As much as the methodology we undertook allows us to benchmark comparable governmental actions, we should emphasize that this ambitious project is intended to celebrate each one of these 50 city governments as clear winners whose stories need to be told.

We hope that this study will inspire all cities to become smart, loveable, and future-ready. We wish you every success in your smart city journey, and trust that you will share our enjoyment in learning from these Top 50 Smart City Governments.

METHODOLOGY

Our methodology involves ranking the top 50 smart city governments from a broad list of cities that were drawn from existing smart city rankings, news articles, and websites. Eighty-two municipalities emerged as the most notable leaders in the worldwide smart city movement, appearing a minimum of two times in smart city rankings such as the 2017 Smart Cities Index by Easypark; the 2016 Cities in Motion Index by IESE; the Smart Cities Ranking by Juniper Research; or Smart Cities Prospects published by Procedia Computer Science. Cities featured in these rankings are pioneers in smart city development, with their governments deserving of further study.

An additional 58 cities that were frequently featured in the past year's news articles were added to this list; these were cities with budding smart city plans but had not yet been accounted for in existing rankings. After screening these 140 cities on their commitment to building a smart city, we ranked the best-performing 50 smart city governments based on several criteria.

Drawing from our experience advising government agencies and devising solutions for urban planning, we note that smart cities may develop on three dimensions:

1. SCOPE

Whether the development of the smart city centered around just a few landmark projects, or if it encompassed a wide range of different city services and municipal departments. For example, Tokyo's smart city plan focuses heavily on sustainability, exploring how technology can reduce food waste and energy usage. On the other hand, Vienna is implementing over a hundred smart city solutions in education, energy management, environment, healthcare, mobility, social inclusion, and urban development.

2. SCALE

The size of the smart city projects, whether denoted by the geographical coverage, citizens involved, or project budgets. For instance, Better Reykjavik is a participatory budgeting portal that allows citizens to suggest and vote electronically on ideas to improve their neighborhoods. This has given rise to over 600 citizen ideas implemented at an average project size of only USD 32,000.

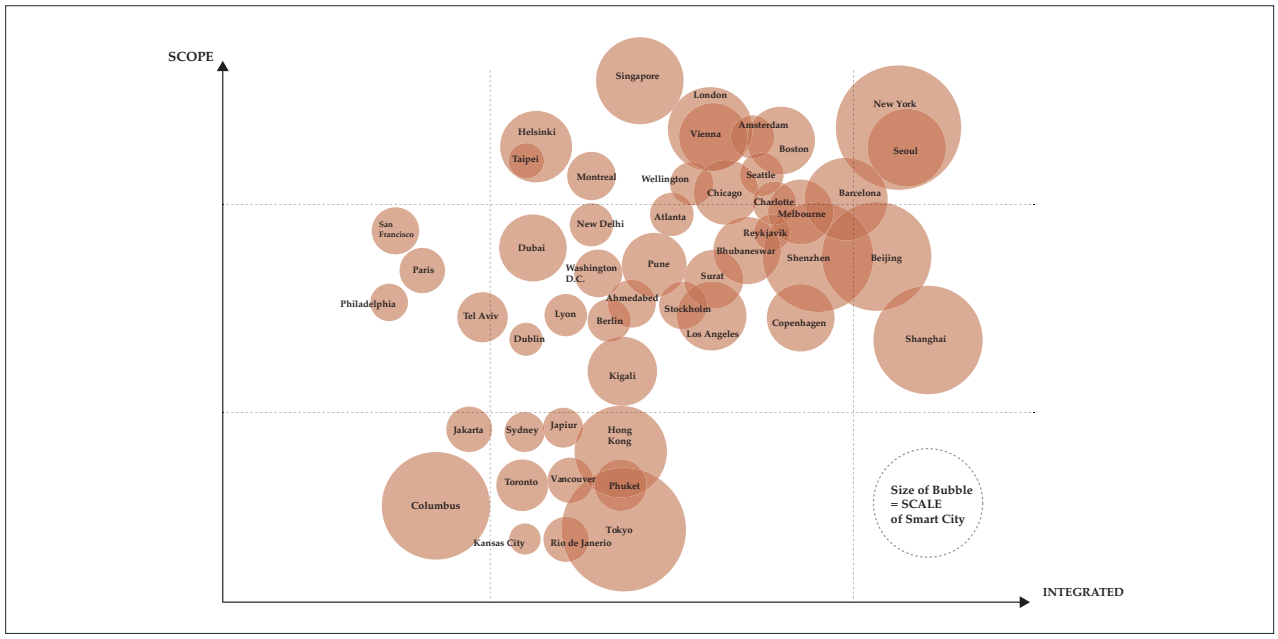
In contrast, central planning in Shenzhen helped its smart city projects scale tremendously. It equipped 700 buses with facial recognition technology. Unique identification numbers were issued to 600,000 buildings and 11 million flats. Its online public service resource centre has 14 billion records and exchanges 20 million records daily.

3. INTEGRATION

Whether the data from the projects were aggregated for analysis and if concerted actions came about as a result. For example, New York integrated the call centres of over 40 City departments into a single municipal services hotline. It analyzed data from over 18 million requests to improve city services, introduce new initiatives, and raise customer satisfaction.

Helsinki's smart city development is driven by different agencies innovating at the municipal level; as a city; for its metropolitan area; and also within its smart district. While the initiatives may not be fully-integrated, the decentralized leadership helps to ensure its resilience as a smart city.

The following overview illustrates how the Top 50 smart cities governments took on comparatively different pathways in developing their projects.



Based on these different pathways, ten rubrics were derived to rank the smart city governments.

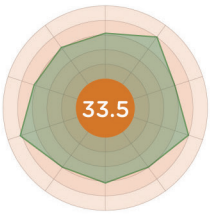
Factors Used To Determine City Government Ranking

VISION	A clear and well-defined strategy to develop a "smart city"
LEADERSHIP	Dedicated City leadership that steers smart city projects
BUDGET	Sufficient funding for smart city projects
FINANCIAL INCENTIVES	Financial incentives to effectively encourage private sector participation *(e.g. grants, rebates, subsidies, competitions)*
SUPPORT PROGRAMMES	In-kind programmes to encourage private actors to participate *(e.g. incubators, events, networks)*
TALENT-READINESS	Programmes to equip the city's talent with smart skills
PEOPLE-CENTRICITY	A sincere, people-first design of the future city
INNOVATION ECOSYSTEMS	A comprehensive range of engaged stakeholders to sustain innovation
SMART POLICIES	A conducive policy environment for smart city development *(e.g. data governance, IP protection, urban design)*
TRACK RECORD	The government's experience in catalyzing successful smart city initiatives

These ten factors constitute a complete range of considerations for city governments to formulate their smart city strategies. Each of the cities were ranked on a scale of one to five representing low to high, based on level of performance determining readiness. Cities were scored on these categories, leading to the final top 50 rankings. With each factor, a "high" would indicate a best-in-class effort that could involve originality and resourcefulness, multiple institutionalized initiatives, demonstrated authenticity and commitment, and success attributable to that vector.

In the final stage of the study, we also engaged with urban planners such as Mayors, Chief Information Officers, and Chief Smart City Project Managers for interviews to validate facts and to share their unique city stories. Primary research with city leaders helped to complete the picture and ensure that each city government was represented fairly and comprehensively in this study.

TOP 50 SMART CITY GOVERNMENTS



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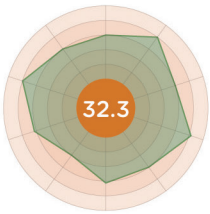

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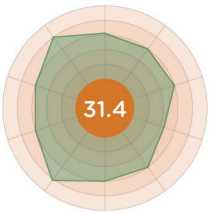

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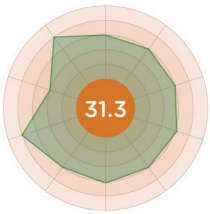

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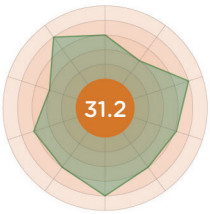

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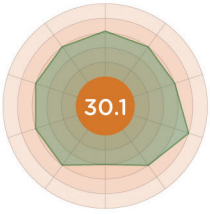

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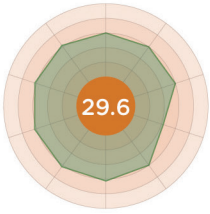

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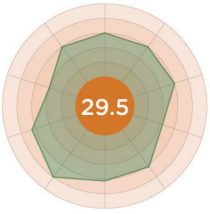

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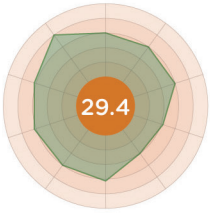

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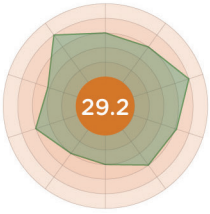

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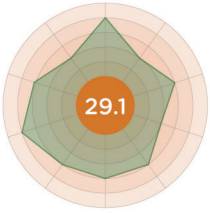

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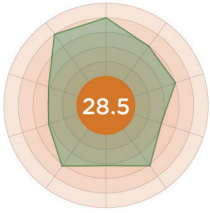

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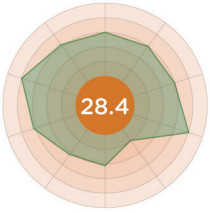

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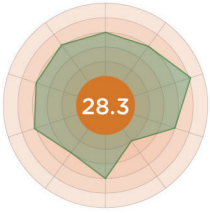

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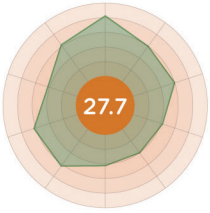

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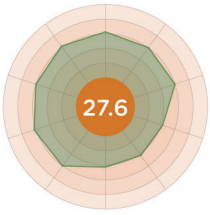

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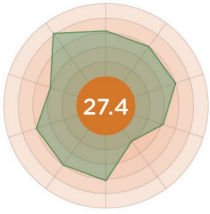

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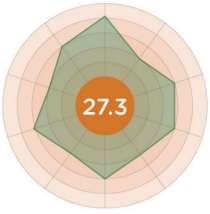

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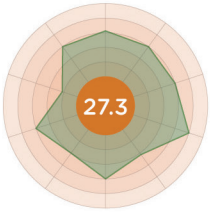

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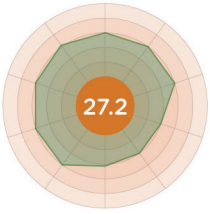

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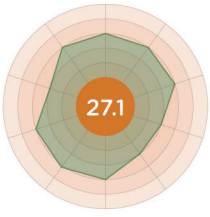

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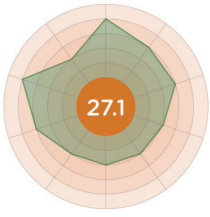

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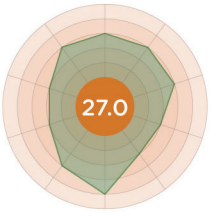

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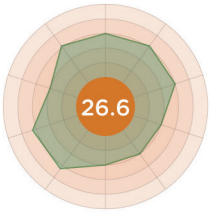

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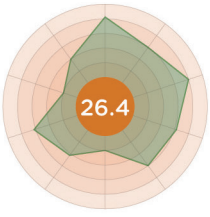

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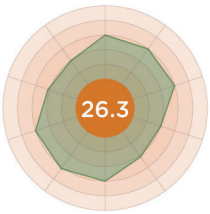

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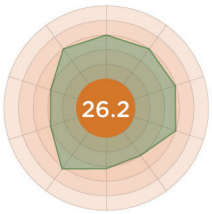

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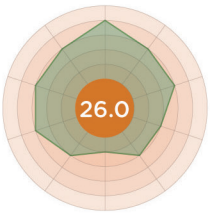

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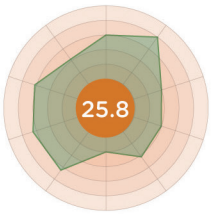

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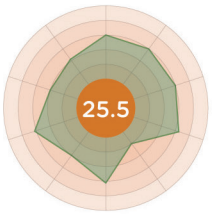

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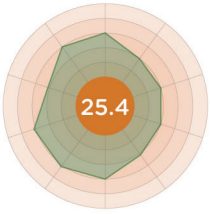

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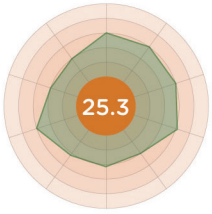

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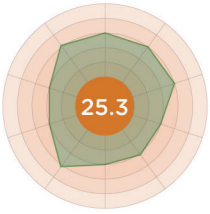

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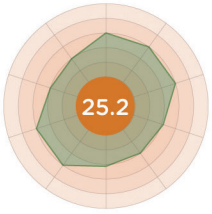

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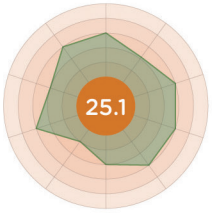

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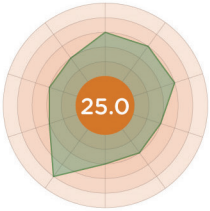

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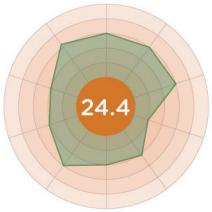

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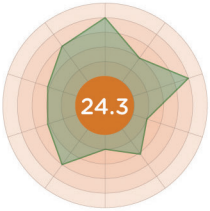

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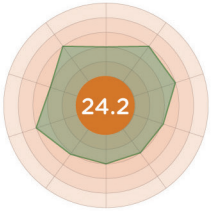

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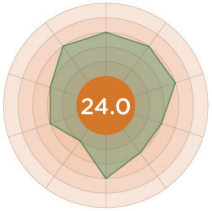

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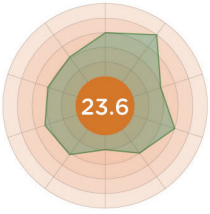

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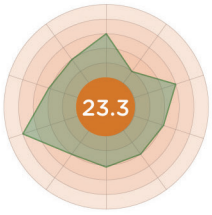

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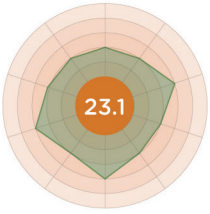

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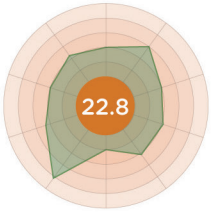

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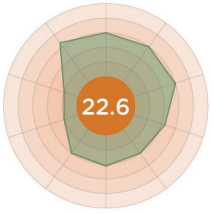

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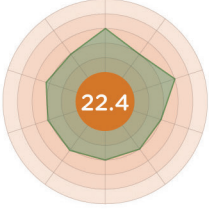

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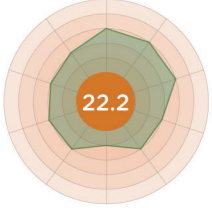

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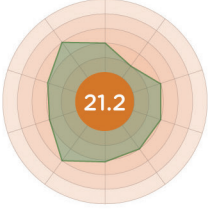

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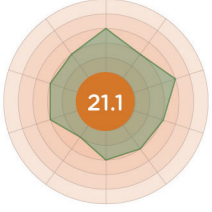

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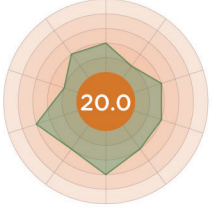

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Themed Observations

In this extensive survey of cities around the world, we encountered several recurring themes that leaders needed to consider in their smart city development. This section outlines our reflections as a playbook of how smart cities went about such decisions differently.

FUNDING SMART CITY INITIATIVES

Budgetary limitations often constrain the pace at which cities can realize their smart city visions. The top 50 cities have turned to innovative ways to secure funding, including competitions and hackathons, partnerships with private companies, smart procurement policies, or national- or state-level funds. In many cases, these acted in concert to improve funding outcomes.

National and State Funding

Thirty-seven percent of our top 50 cities accessed national- and state-level funds. Innovation Norway is a national-level initiative that offers between USD 6,000 and USD 90,000 in grants to assist start-ups to experiment, design, and commercialize smart city products and services, which helps ease the funding burden of city governments. Sweden's Vinnova also allocates national public funds to smart city projects. Innovation Fund Denmark's Grand Solutions funds up to USD 30 mn for challenge-driven research that creates societal value, including smart city research. Each of these cases and many others indicate the national- and state-level willingness to invest in smart city technologies, companies, and projects. Mayors could therefore negotiate and coordinate with state and national governments and agencies to establish and direct funds towards specific funding gaps. In these Scandinavian examples, the national government relieved city governments of the role of funding research and start-ups, allowing city governments to focus on funding smart city projects directly.

Private-sector Participation

Twenty-three percent of cities relied upon private organizations, who acted independently or in partnership with the city government. On top of Montreal's USD 75 mn support for smart city startups, venture capital firms offer funding to local smart city start-ups. Google affiliate Sidewalk Labs is co-funding a USD 50 mn pilot project with the City of Toronto, where it will re-locate its Canadian headquarters to. Of the USD 20 mn spent on Smart City developments in Kansas City, only USD 3.8 mn came from the city budget. The remaining investment was absorbed by organizations such as Cisco, Sprint, Smart City Media, Think Big, and Google through public-private partnerships. Large private companies, particularly those in the technology space, are keen to help shape the smart cities they are in, and offer specialized expertise, intimate knowledge of consumer segments, and networked resources that come along with their own invest-

ments. City officials can encourage funding or participation in smart city projects with, for instance, exclusive operation rights or access to specific sets of data.

Hackathons and Competitions

Eighteen percent of the top cities used competitions and hackathons to identify worthwhile smart city project investments. Reykjavik offered USD 9,500 to the winner of its 2018 CityHack, a civic innovation hackathon seeking solutions for its smart city future. The City of Melbourne hosts open innovation competitions and challenges to target specific issues like accessibility and provide cash

prizes totaling USD 30,000 through private company sponsorship. Collaboration between Smart Dublin and Enterprise Ireland resulted in the Small Business Innovation Research Competition, which awarded more than USD 230,000 to 16 winners. We observe in numerous examples like these that hackathons and competitions act as merit-based funding sources for start-ups and citizens, while leading to practical results such as pilots, prototypes, and live experiments that improved visibility to attract follow-on funding. Cities with high levels of civic participation could easily and affordably host hackathons and competitions with the intention of funding innovative smart city project ideas, or co-host with partners that may offer corporate challenges and sponsorship.

> *We observed in numerous examples like these that hackathons and competitions act as merit-based funding sources for start-ups and citizens ... that improved visibility to attract follow-on funding*

Smart Procurement

Nine percent of the top cities used smart procurement policies and practices, to optimize the use of public funds. Amsterdam initiated a new Startup-in-Residence programme – based on a similar programme in San Francisco – to connect government agencies with start-ups, incentivizing project initiations through a simplified procurement process. The Forum Virium Helsinki channels companies into open tenders for experimentation, prototyping, and full-fledged projects, while providing ecosystem assistance and opportunities to collaborate on new ideas. City governments with a robust start-up ecosystem could devise smart procurement policies that ease entry barriers and streamline the flow of funds to projects. By shifting calls for tenders from prescriptive procurement to performance-based pricing, cities are able to increase the flexibility and variety of approaches to smart city solutions.

Reflections

What are some projects that our city is funding, which could have a national-level interest?

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How can we nurture greater private sector participation in developing our city?

•

Does our public procurement encourage creativity and participation from start-ups?

DEVELOPING A SMART CITY STRATEGY

Developing a smart city vision involves multiple stages: Defining the relevant smart city concepts; designing the planning process; engaging and drafting approaches with stakeholders; as well as prioritizing initiatives and crafting the roadmap. While many cities engage their citizens as plans are implemented, only 17 of the top 50 cities involved stakeholders outside of Government authorities to co-create the smart city vision and mission. Of the top 10, this trend was more significant with 50 percent of cities falling within this category.

The cities that engaged stakeholders for the visioning process utilized a broad set of engagement modes, at different phases and for distinct purposes. This included engaging citizens in town hall meetings to help define the smart city vision, bringing together private and public entities in working groups to lead the visioning and planning exercise, and offering multiple and diverse platforms catered to different citizen groups to surface key issues and preferred solutions for each group.

Anchoring a Vision on Natural Strengths

A first step in developing a smart city strategy is to take stock of a city's natural strengths and assets. This may lead city governments to develop their smart city plans in a specific field, taking advantage of the well-established ecosystem to accelerate the initial stages of transforming into a smart city, and building confidence to embark on other fields. 12 percent of the top 50 ranked cities used this approach. Copenhagen's vision, for instance, is to become the world's first carbon-neutral capital, leading in global green growth through data and innovative technology solutions by 2025. The city's strong reputation and established base of sustainability start-ups helped the city government secure partnerships to implement its Smart City Street Lab to testbed smart sustainable solutions. On the other side of the globe, Phuket has been ranked as Asia-Pacific's fifth-most popular tourism destination , and similarly articulated a smart city aspiration to become a *"tourism island of sustainable growth"* by 2020.

Building on Citizen Ambitions

Montreal engaged citizens extensively in line with the City's aim to create trust with the citizens . The city government relied heavily on their citizens to inform the smart goals and areas of development. Over seven thousand citizens participated in the visioning process, of which 43 percent voted for, "*A city that develops services enabling small, medium-sized and large businesses to grow and create new jobs*," and "*A city that support new immigrants and job seekers*."6 As a result, Economic Development was chosen as a key pillar in their smart city plan.

Encouraging Private Sector Involvement

In Toronto, discussions with private entities, citizens, and government officials surfaced a lack of consensus on what "Smart" should really mean to local stakeholders. Realizing that "Smart," was not something that could be achieved alone, the City set up a working group comprising companies such as Telus

Corp, IBM Corp., Bell Labs, Roger Communications Inc., and Toronto startup incubator MaRS, to define the "smart city" concept and strategy. 137 formal submissions were reviewed using a cloud-based decision-making software and translated into six tangible solutions, that were tested using workshops to assess the level of interest, possible involvement and private sector partnerships that could be formed across the groups. Toronto's openness to early partnerships is unique from a traditional approach of forming partnerships only after the smart city plan has been decided, which carries the risk of solution misalignment or lack of support.

Identifying Smart City Focus Areas

In India, Surat drew inspiration from citizen suggestions and developed its Smart City proposal based on a public preference for ICT based Transport-Connectivity smart solutions. Jaipur's visioning process involved collecting 147,421 responses via its polling platform, a 4.5 percent conversion rate. Heritage & Tourism and Traffic & Transport were extracted as key areas of development and were translated into 15 projects under Jaipur's smart city plan.

Prioritizing Opportunities

Cities need to establish their own criteria to prioritize the many opportunities in their smart city plan. In the case of Montreal, a total of 230 citizen ideas were received and 70 percent of these helped to formulate projects. In order to prioritize, a comprehensive set of selection criteria, including impact on structural components, contribution to strategic orientations, breadth of impact on citizens, return on investment, and short or long-term implementation period, were transparently published and used to finalize 70 projects for the city.

Planning, Sequencing, and Validating Initiatives

Pune implemented a five-step approach when implementing its smart city plans: Envision, Diagnose, Co-create, Refine and Share. The City ran two-day long mini-labs for elected representatives and citizens to refine solutions. They also gathered support from associations and citizens, using a Signature campaign, support letters and MOUs. To keep the momentum going, the City set up a "*My Budget*" initiative opening up channels for citizens to continue sending in their ideas to be included in the municipal corporation's budget meeting, post the smart city plan development.

On the whole, while the different cities approached stakeholder engagement using various means, engagement at the early stages was a common theme seen across the top-performing city governments, with early citizen buy-in easing the roll-out of smart city solutions.

> *Engagement at the early stages was a common theme seen across the top-performing city governments, with early citizen buy-in easing the roll-out of smart city solutions.*

Reflections

What should be out city's own definition of Smart City?

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Which forms of stakeholder engagement are most suitable for our various constituents?

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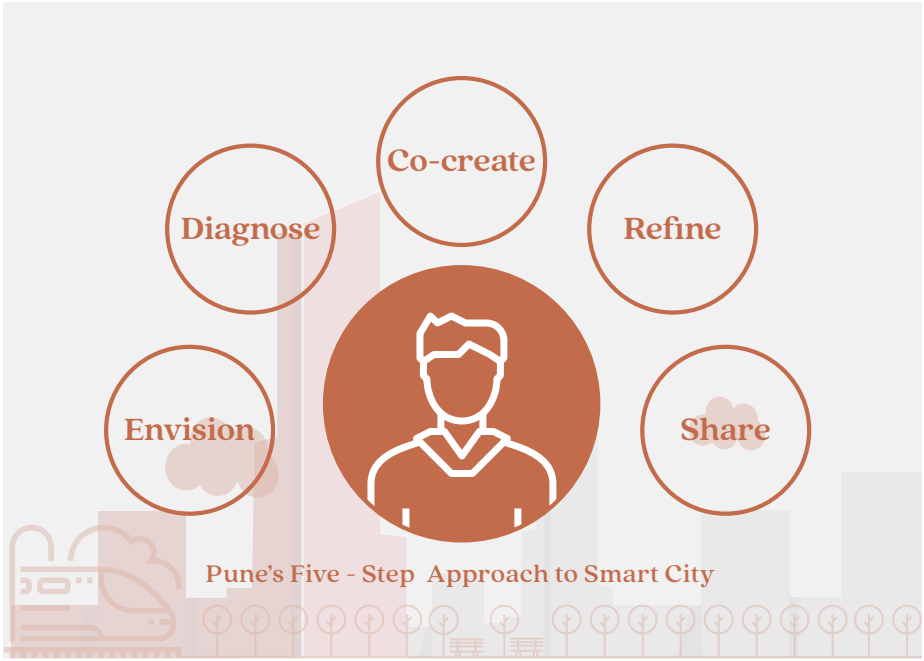
Are we fully using our citizens as a resource when designing smart city solutions?



Pune's Five - Step Approach to Smart City

SMART CLUSTERS & INNOVATION DISTRICTS

Smart districts and innovation hubs are trending in the Smart City world. From the world-renowned Silicon Valley, Kansas City's downtown the "54 smartest blocks in the United States," and the Boston Waterfront Innovation District, to Helsinki's Kalastama smart district, Singapore's Punggol Digital District, and the up-and-coming 22@Barcelona, cities around the world are increasingly experimenting with geographically-concentrated innovation ecosystems.

Smart Districts as Hubs for Knowledge Exchange

Firstly, gathering a city's entrepreneurial minds in one innovation district increases the exchange of knowledge. Smart districts are well-connected, with shared spaces and events designed to facilitate spontaneous encounters and flexible meetings. The resulting relationships fostered in co-working spaces, weekly district-wide professional meet-ups, and conferences often lead to formal collaboration within the local innovation communities.

These clusters also foster the sustainability of businesses by attracting and developing talent, while encouraging resources to be shared. The 'anchor' experts and innovators themselves attract more experts and innovators, so they can increase their intellectual productivity. Incubators and accelerators feature often among smart city districts, supporting the development of businesses through mentorship, financial resources, and by attracting venture capital firms.

Tailoring Smart Cities to Local Needs

There is no standard approach that comes with designing a smart district. In fact, some of the most successful innovation hubs around the world were conceived in response to city-specific needs. 22@barcelona, for example, was created to encourage international companies to interact with local companies and institutions rather than merely set up offices in the city. This new innovation ecosystem has led to partnerships among local research universities and businesses, giving local talent access to intellectual resources and opportunities to practice their skills on smart city projects.

In Singapore, the Punggol Digital District is being created with the aim of helping the city accelerate its Smart Nation vision. The district is a pilot

"There is no standard approach that comes with designing a smart district. In fact, some of the most successful innovation hubs around were conceived in response to city-specific needs"

for new ways of living and working in Singapore, and designed to create jobs of the future. The initiative helps improve technological innovation by offering a safe testbed for possible smart city solutions, containing the risks from a direct nationwide roll out.

Smart District Models as Innovation Testbeds

Smart districts have been successfully developed top-down; decided and led by the government or local authorities, as well as bottom-up, initiated and driven by the private sector.

Following the success of several innovation hubs around the world, cities such as Charlotte, Berlin, Boston, Singapore, and Vancouver have allocated parts of their municipal or government funds to creating smart districts. Smart districts allow better control of spaces, to design programs customised to the ecosystem, and align the ecosystem with their own smart city vision and focus. Berlin, for example, particularly values environmental sustainability, which heavily shaped the creation of the Moabit West Smart District equipped with efficient transportation, water management, and energy.

While municipalities and authorities often shape the entrepreneurial and business ecosystem through investment and regulation, entrepreneurs and businesses have also led transformation efforts. Silicon Valley is perhaps the most classical example of an innovation hub that operates with minimal government involvement, as an area whose technological advancement was continually upgraded. Tel Aviv, too, became a smart city mostly

through the efforts of its citizens and entrepreneurs to promote an innovative and collaborative culture. The city encouraged entrepreneurship, and in return, entrepreneurs brought smart technologies to the ecosystem and tailored it to the city's needs.

Diversify Stakeholder Base to Share Best-of-breed Partners

Universities have also been observed to play a role in initiating smart districts. Educational institutions have a strong incentive to leverage their talents and further their research in innovative spaces. Many incubators and accelerators are actually run by universities, and encourage students to apply their academic knowledge in designing practical marketable solutions. The University of Washington, for example, has partnered with Seattle to transform its university district into an innovation zone. This zone will be a space for the public and private sectors to collaboratively design socially-beneficial technologies.

We can see that building a smart district does not necessarily fall on the municipality's shoulders. Several other stakeholders are interested in having such initiative and would willingly contribute to its development. Collaboration between the government, private sector, and academic institutions is crucial to ensure the quality of the innovation ecosystem. These different contributors usually bring different assets to the initiative. Municipalities tend to be best placed to regulate, while universities can provide knowledge and talent. Businesses tend to bring their management capabilities and customer understanding to the table. There is no clear rule to these contributions, however, and each stakeholder's involvement will often depend on the existing resources and culture of the ecosystems.

Reflections

Would developing a smart district help to accelerate our smart city ambitions?

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How should a smart district best synthesize its roles as a testbed and a knowledge hub?

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How much private sector involvment is optimal to testbed our smart city deployments?

DIGITAL INCLUSION IN SMART CITIES

A city only becomes truly "smart" when all citizens are ready for it. Urban planners and innovators might develop personas of the ideal "smart citizen" as they prepare future plans for their cities. These often assume that citizens enjoy Internet access, and are tech-savvy enough to use and interact with the city's spaces and services. Reality, however, presents a wider range of city users, and cities risk excluding entire segments of their population from the smart city experience if efforts are not made to bridge the digital gap.

Accounting for Every Group

Digital technologies in a smart city should help improve the management of businesses and administrations, the efficient allocation of resources, and most importantly the quality of life of all citizens. Yet, there have been instances where the implementation of these technologies overestimated the citizens' readiness to move online. In Florida, for example, government services such as Assistance Applications for the Florida Department of Children and Families abruptly migrated to online portals. When this happened, local libraries were flooded with users who did not have computers or Internet access at home. Resultantly, the low utilization rates for many of these spaces and services was because some groups were still not adequately equipped to use smart city technologies.

Devices as a Starting Point

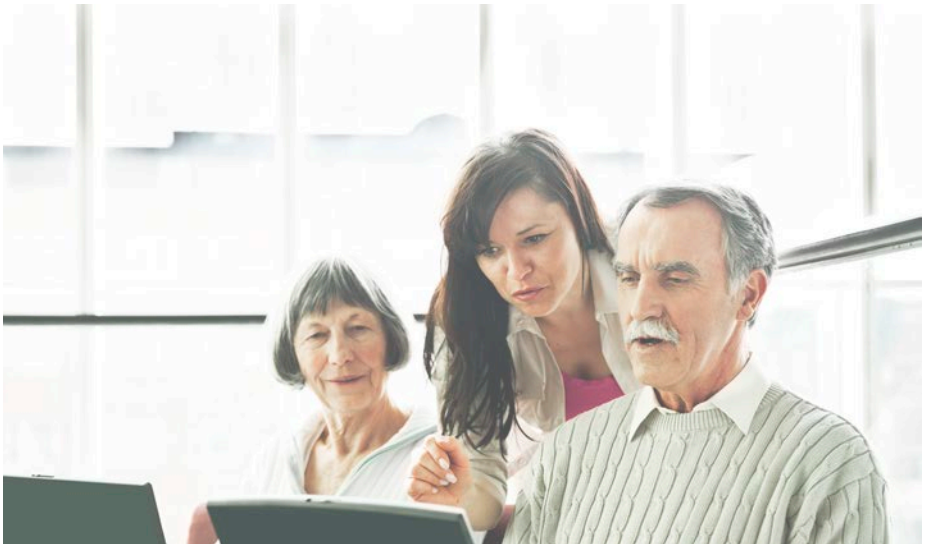
Citizens cannot access online services without a device. Certain population segments, such as elder-, minority-, or economically-vulnerable groups, are less likely to own such devices. To enable this access, some cities have decided to install accessible computers in public spaces. In the US, computers in public libraries are used on a daily basis by millions of citizens, mostly to access government online services and for research. Interactive kiosks are installed in bus stops of Kansas City's poorer neighbourhoods to deliver city information, not unlike the LinkNYC kiosks that replaced New York's phone booths. In Florida, citizens use public computers to apply for public assistance including food stamps, temporary cash assistance, and Medicaid. Some cities have gone

"Reality presents a wide range of city users, and cities risk excluding entire segments of their population from the smart city experience if efforts are not made to bridge the digital gap."

even further to equip citizens with personal computers through laptop programs. In Kigali, the government has started offering loans to university students to purchase laptops. They have also launched the "one laptop per child" initiative, distributing over 200,000 laptops to 400 public schools.

Internet Access from Every Device

Once people have access to devices, they will also require Internet access. A most popular form of government-sponsored Internet access is seen in the form of public Wi-Fi areas around the city. London, for example, has 5,969 public Wi-Fi hotspots across Greater London, and invested USD 2.32 mn through the Super Connected Cities Program to offer indoor public Wi-Fi in Galleries and Museums. The City of Stockholm has gone one step further to partner with private company Instabridge to offer a mobile application that helps users identify



free Wi-Fi hotspots around the city. Taiwan has also started offering a national, government-backed network of over 5,000 hotspots. The private sector can also play its part - citizens in Brazil access the Internet through Internet cafés that charge anything between 40 cents and USD 1.50 per hour of Internet usage. Private sector organisations such as Internet.org have been also actively exploring non-traditional ways to offer Wi-Fi since 2014, such as through balloons, drones, and satellites.

> *Teaching people how to use computers and navigate the digital world is a final and critical aspect of a digital inclusion plan.*

Growing IT Literacy

Teaching people how to use computers and navigate the digital world is a final and critical aspect of a digital inclusion plan. As part of London's inclusive smart city vision, it has established a number of digital literacy programs, and even investigated the reasons behind the digital exclusion of minorities and vulnerable groups. The city found that the lack of confidence in engaging with technology and cost of digital technology have been the main obstacles to its digital inclusion efforts. These obstacles might differ for other cities. Research led by Michigan Technical University revealed that several senior learners fear going online because they are scared of being scammed or of having their identities stolen, arising from having heard others' stories.

Reflections

Are there certain groups of citizens that we may have underserved, in our journey to become a smart city?

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How should our digital inclusion program balance considerations of affordability, devices, infrastructure, and digital library

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How effectively has our digital inclusion strategy built confidence among all citizens?

THE PROMISE OF OPEN DATA

Citizens increasingly demand more transparency and accountability from public administrators, while city governments are eager to enhance smart city innovations. Open data has emerged as a cost-efficient way to increase civic engagement, introduce city projects that attend to citizen needs, track the performance of smart city initiatives, improve efficiency and responsiveness, and apply knowledge from the general public to city solutions. Eighteen of our top 50 cities were using some form of open data, across a wide range of applications: For example, it can help tourists to better plan their trips by allowing access to public transportation routes online; residents to gauge the city's sustainability impact by analyzing energy usage and waste management figures; and startups to launch health app for asthmatics to avoid places that increase the risk of asthma attacks.

Data Sharing and Usage

Smart cities around the world employ different means of sharing data with external actors, from simply releasing data to the population at large, to taking concerted efforts to drive targeted segments to work with the data. For example, smart cities like Copenhagen, Chicago, Hamburg, Los Angeles, and Melbourne have online portals that share large datasets and statistics on traffic, pollution, infrastructure, demographics, economic, health, climate, and cultural activities. This approach requires standardizing and pooling data from all city services, facilities, and agencies together. Los Angeles' Mayor achieved this by instructing each of the city's 45 departments to appoint a data steward responsible for unlocking, cleaning, publishing, and regularly updating departmental data to the city's portal. The City provided its data team, a metadata guide, and example datasets to support these data stewards. On the other hand, Seattle appointed a data leader to actively host meetings, hackathons, and design labs in resident communities in order to raise awareness and actively encourage residents to use the city's open data to develop new applications. In 2016, the City of Stockholm also organized an international competition where participants – innovators, entrepreneurs, startups, and students – used the city's open data to create products and services that bring Stockholm closer to its Smart City vision.

> *By sharing data that can be easily understood and manipulated, cities have the best chances of seeing citizens, startups and businesses drive new innovations.*

Data Formats and Functionalities

Open data can be shared in multiple formats of varying sophistication and ease of use. For example, data files that require paid software may not be accessible to all citizens. Unstructured data (such as free-form text) cannot be manipulated as easily as structured data formats (e.g. in spreadsheets). In comparison, online, dynamic maps like those Hamburg provides on its Transparency Portal allow users to filter and cross-check a range of variables. Data visualization can help make sense of complex data. In Finland, the City of Helsinki provides over 200 heat maps, historical maps, and 3D maps of interlinked data through its portal. By sharing data that can be easily understood and manipulated, cities have the best chances of seeing citizens, startups, and businesses drive new innovations.

Need for Data Skills

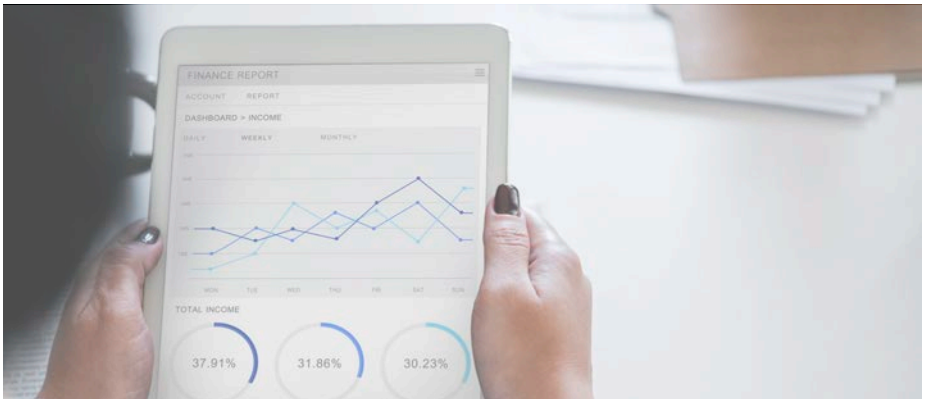
A city must ensure that open data users have the necessary skills to analyze the data. Rio de Janeiro equips citizens with skills to access open data platforms by hosting forums and providing open data manuals. City employees of Seattle were sent to a three-day Data Camp to be trained on the open data portal and other data skills. In Helsinki, the Open Knowledge Foundation Finland, which groups enthusiasts and experts of open data, offers courses to train government staff on open public administration data and open cultural data. The foundation also organizes roadshows to share about open data with local communities.

The Importance of Data Policy

Cities are only starting to recognize the need to establish open data policies. Among American cities, San Francisco devised and communicated open data policies that place a high premium on citizen privacy, leading to the appointment of a Chief Data Officer to safeguard citizens' expectations of privacy. In contrast, Washington D.C. sees data excluding personal information as "open by default". Shenzhen takes the use of data further by using facial recognition, artificial intelligence, and social media data to identify and fine jaywalkers instantaneously. In the case of London, the government has defined rules and guidelines for its open data platform to work with public and private sector organizations, enable common data standards, identify and prioritize data needs, protect privacy, and guarantee a transparent use of data.

Benefits of Open Data

According to the City of Helsinki, setting up an open data platform resulted in budget savings of one to two percent, with increased transparency and accountability pushing civil servants to be stricter in public procurement. In addition, releasing information about government decisions, services, and land use has increased citizens' involvement and trust toward the city officials. A study of the European Union forecasts that open data will allow European administrations to save costs of up to USD 2 bn a year.



> *Releasing information about government decisions, services, and land use has increased citizens' involvement and trust toward the city officials.*

Reflections

How can we realize the value of open data in our city context?

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How should we establish boundaries in our open data strategy?

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What should a data governance policy for our smart city address?

CO-CREATING THE SMART CITY

We have observed a ready willingness for many of the top-ranked cities in our study to accept that they may not have all the answers. They recognize that involving outside stakeholders such as businesses, startups, students, and the public at large can lead to larger variety, volume, and quality of insights, ideas, and feedback to cost-effectively create the most functional smart city initiatives. In turn, citizens have shown great enthusiasm when they are given the opportunity to participate in designing and deciding their cities' future. For instance, when Copenhagen asked its residents to provide feedback on how to improve cycling paths in the city, over 10,000 recommendations were submitted in the first 12 days. These insights were used to develop a more inclusive strategy for its cycle path infrastructure. We have observed different approaches to engage with stakeholders among the top 50 cities in this ranking, based on specific city contexts.

One-way Engagement

The first step of citizen involvement in smart city efforts involves simple, one-way interactions between the city government and the public. A basic co-creation platform is to have a suggestion box on the city's website. Cities like Amsterdam, Boston, Copenhagen, Shanghai, and Stockholm offer suggestion platforms, mostly in the form of apps, to crowdsource city problems experienced by users. The residents of Stockholm can report deficiencies in the traffic infrastructure or the outdoor environment, such as waste bins that need emptying, broken streetlights, graffiti, or fallen tree branches. The app allows for images from the mobile camera to be geo-tagged and attached to service requests. Between 2013 and 2016, the number of cases submitted each year has risen steadily, from 56,000 in 2014 to 100,000 in 2016. At the same time, the size of the population and divergent issues mean that other larger cities may demand multiple engagement platforms to target different citizen groups: While house visits and group discussions are essential to engage with rural communities, mobile polling, online surveys, online and email feedback offer channels closer to urban population touchpoints. In Delhi, social enterprise Social Cops has come up with a mobile app that allows citizens to report municipal problems, and has since entered into a data sharing partnership with the Indian government.

> *A next stage of co-creation is to inform outside stakeholders about current and planned smart city projects, allowing them to suggest new ones, and vote online for their preferred projects.*

Online Discussions

A next stage of co-creation is to inform outside stakeholders about current and planned smart city projects, allowing them to suggest new ones, and vote online for their preferred projects. Online discussions can surface on-the-ground insights, minimize design flaws, and win their support, provided the right platform is available. For instance, Amsterdam launched an online portal which now counts over 150 project partners active in over 100 innovative energy, mobility, and circular economy projects. Interactive maps can enhance online engagement, as seen in Stockholm: The City provides a web interface where visitors can study planned buildings as 3D models, assess information by clicking the buildings, and leave comments and suggestions as well as review those left by others. Amsterdam further supports promising ideas by providing access to a wide range of potential project partners.Taipei's government even assists citizens in conducting field experimental pilot programs and helping develop smart city business models. Companies with smart technologies can also visit the portal to be inspired by innovative business ideas and possible partnerships. In Reykjavik, an online consultation forum allows around 70,000 users to submit, discuss, and prioritize ideas about the municipality's public services and administration. After a council's assessment of the feasibility and costs of top-rated ideas, citizens are invited to vote on them. Since 2012, USD 20 mn has been invested in implementing over 600 ideas from this forum.

> *In areas where online access is less available, or when beneficiaries have very specific needs, co-creation more often involves offline, physical interactions with citizens.*

Deepening Involvement

In areas where online access is less available, or when beneficiaries have very specific needs, co-creation more often involves offline, physical interactions with citizens. In India, the Smart City Office of Bhubaneswar promotes socially smart initiatives by engaging with youth to develop youth-centric and youth-led social interventions. As a result of this engagement, 60 peer leaders were trained to take leadership at the community level. The City of Hamburg invited residents to their Smart Citizen CoLab for two days, to prototype new citizen-centric services, discuss key features that new projects should offer, and discover innovation opportunities. Helsinki's Mayor not only broadcasts live webcasts of City Council meetings, and allows City decisions to be appealed, but even holds regular meetings for residents at different parts of the city to ensure the widest possible access. Another city that excels at citizen-centric innovation is Melbourne. The City works with people who are blind and deaf, to better understand how they navigate through the city. The City then partnered with a private organization to trial a technology that transmits location-specific information to phones. These examples show how working closely with different population segments can help surface unmet needs, design, and validate effective and targeted solutions.

Reflections

How can we ensure that all government officials truly listen to their constituents?

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What can we do to help our citizens volunteer high-quality feedback?

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How do we tap into the collective talent of its citizenry, to co-create our smart city?

SMART CITY LEADERSHIP MODEL

A government's smart city leadership has profound impact on the realization of its vision. In the early stages of a smart city journey, it may suffice to appoint an individual to initiate, coordinate, and spearhead initiatives. However, Governments need to design flexible pathways for leadership to naturally evolve, as smart city initiatives increase in complexity or range, as the focus of initiatives broaden, or as the numbers of constituents grow in the city.

Most of our top-ranked cities led their smart city initiatives with a single, dedicated office. Some cities either distributed responsibility across departments in line with departmental mandates, (rather than funnel all smart city initiatives through a single office), or formed public-private partnerships to jointly steer their smart city solutions with industry.

Dedicated Office

The first leadership model is illustrated by cities such as Amsterdam, Bhubaneswar, Dubai, London, Singapore, and Taipei, which have dedicated officials or departments driving the smart city vision. For example, Wellington has appointed an Innovation Officer to coordinate smart city initiatives among various municipal departments. Singapore's Smart Nation Office has a budget of USD 1.7 bn over four years, and reports directly to the Prime Minister's Office to ease coordination across all government ministries in the island-state. It considers the capabilities required by the government to remain future-proof, encourages the digitalization of services and information, and advocates for smart city services. At the early stages of a smart city journey, the consolidation of smart city initiatives into a single organization increases accountability, centralizes and clarifies data ownership, and simplifies communication.

Distributing Responsibility Across Departments

Cities such as Helsinki, New York, and San Francisco exemplify the second leadership model. Different smart city projects in Helsinki are driven at the district, metropolitan area, city, state, and regional levels, which fosters resilience in cases of shifts in talent or budgets. New York distributes responsibility across several municipality offices, each with their own scope, resources, and collaborations to deliver smart city solutions. Decentralizing responsibil-

> *Governments need to design flexible pathways for leadership to naturally evolve, as smart city initiatives increase in complexity or range, as the focus of initiatives broaden, or as the numbers of constituents grow in the city.*

ity across several departments takes advantage of specialization, brings focused expertise to targeted problem areas, and calls for inter-agency collaboration as complexity arises when smart cities mature. Without a singular, overarching smart city strategy, San Francisco similarly shares the responsibility for various smart city initiatives across its agencies and departments: Smart parking or smart traffic are driven by the Municipal Transportation Agency; the Department of the Environment uses smart city applications to reduce waste and increase recycling; while the Department of Technology oversees eGovernance and digital inclusion initiatives.

"Decentralizing responsibility across several departments takes advantage of specialization, brings focused expertise to targeted problem areas, and calls for inter-agency collaboration as complexity arises when smart cities mature."

Public-Private Entities

The third leadership model involves forming partnerships with private organizations to drive smart city solutions. Envision Charlotte, which spearheaded Charlotte's initial foray into smart city territory, was formed as a partnership between Cisco, the local energy supplier, and the city center development office, to significantly reduce energy costs incurred by commercial buildings in the city center. Similarly, Chicago launched "Smart Chicago" in partnership with a local foundation and fund, to co-create smart city solutions with residents through civic participation, functioning alongside the government's own systematic application of smart city solutions. The Berlin Senate empowered four organizations in a private-public partnership, to scope and implement its smart city strategy, including policy formulation, funding, ecosystem promotion, and experimentation.

The effectiveness of these three smart city leadership models depends on the level of city maturity. Ultimately, when a public-private entity drives the implementation of the smart city strategy, the entire ecosystem can rally around the identified objectives, closely integrating know-how with planning and execution, and adapting to the ever-changing technological landscape.

Reflections

Do we need to appoint a dedicated lead to coordinate and drive our smart city initiatives?

•

As our city matures, what would decentralized smart city leadership look like?

•

How can we align our interests with the private sector, so they can help to steer our strategy in the best interests of the city?

SHARING KNOWLEDGE ACROSS CITIES

With hundreds of cities around the world seeking to become future-ready through smart city solutions, city leaders have access to extensive knowledge networks and do not have to accomplish their smart city missions in isolation. Planners can curate the right knowledge-sharing circles to improve ideation, expedite progress, and amplify the impact of smart city initiatives, in line with the assets, needs, and aspirations of a city. Eighty-six percent of these top-ranked cities hosted smart city conferences and expos. They also participate actively in study trips and round tables to share their learnings with other cities, gain inspiration, and to curate international good practices. Other alternative knowledge sharing mechanisms include undertaking joint ventures, collaborative planning, and fostering specialized knowledge and industry clusters.

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Learning Networks and Facilities

Leading smart cities have been very deliberate about knowledge sharing. For example, Helsinki, together with Espoo, Vantaa, Tampere, Oulu and Turku, formed an open innovation platform called 'The Six City Strategy' to share and learn from USD 53 mn of smart city projects since 2014. Helsinki also collaborates extensively with other European cities through Horizon 2020 projects, EIT Digital and the EIT Climate-KIC. The City regularly hosts events such as Smart City 2018, European Alliance for Innovation conferences, Nordic Smart Building Convention, and SmartCity 360°. Its smart district Kalasatama has also welcomed 1,500 innovation tourists in the last two years, comprising experts from 98 groups who have come to study Helsinki's model.

A knowledge cluster can consist of both a physical establishment and a sharing mechanism. The New Delhi Municipal Council (NDMC) launched India's first training center for smart city skills, "Pradhan Mantri Kaushal Kendra (PMKK)" in October 2017, under Skill India Mission. The center is expected to offer short and long-term training and certification for 40,000 citizens annually. Meanwhile, Skill India Mission aims to update the skillsets of NDMC employees through global exposure, for example sending a gardener as a delegate to visit Belgium to observe and bring home the best gardening practices.

The applications of smart city solutions do not have to be limited by the demands within the initiating city. Tartu spearheads the Estonian Smart City Cluster by convening more than 25 partners including city governments, universities, science parks, multinational enterprises and start-ups from different locations. Capitalizing on its existing strength in ICT infrastructure, Tartu curates the knowledge cluster to gather ICT and infrastructure companies and aims to become an internationally leading exporter of ICT-based smart city solutions.

Shared Campaigns

Other than solving problems together, cities join smart city knowledge clusters to gain traction, garner inputs, and obtain access to resources. Vancouver and Surrey, the two largest cities in British Colombia in Canada, have proposed to become "Smarter Together", jointly making it to the final round of the Canada Smart Cities Challenge to compete for a USD 38 mn grant. The two cities managed to attract wider attention and more citizen participation through the joint campaign. After conducting 2,200 surveys, sparking conversations among 58,000 social media users, and surfacing more than 250 ideas from the public, the cities selected smart mobility as their priority.

"Other than solving problems together, cities join smart city knowledge clusters to gain traction, garner inputs, and obtain access to resources."

Joint Projects

Cities have never been as interconnected as they are today. Those with compatible needs and expertise have immense opportunity to jointly solve common smart city challenges. Sitting at the two ends of one of the busiest cross-border routes, Helsinki and Tallinn joined forces to ease traffic congestion using a suite of intelligent transport solutions. Each city shoulders the responsibility of piloting mobility solutions that offer benefits to both cities. For example, Helsinki is piloting a Just-on-Time smart queuing system to minimize the ferry waiting time for trucks, reducing traffic volume at its harbor. Tallinn is piloting a Smart Park & Ride system, which offers drivers free parking in the outskirts of the city, to encourage the use of public transport in the city. The vibrant start-up ecosystems and mature ICT infrastructure in both cities paved the way for a twin-cities collaboration in growing smart mobility. Offering a new model of concerted planning and joint implementation to solve cross-border challenges.

Reflections

Which other cities are facing similar issues that we are working on?

•

How can we best institutionalize learnings from our smart city journey?

•

What creative cross-border knowledge partnerships can we develop?

PREPARING A SMART WORKFORCE

Leading smart cities recognize the importance of supporting their citizens of all ages with digital skills. Learning experiences have included civic hackathons to help communities familiarize themselves with digital tools, formal educational programmes, as well as industry immersion to help create a workforce that is ready for the jobs of the future.

Learning Digital, Digitally

Digital platforms such as Massive Open Online Courses (MOOCs) are gaining popularity even among less developed cities, and helping learners access high quality education and become adept in digital skills. To mentor entrepreneurs, India's Central Government's Entrepreneurship Education and Training (EET) will be implemented in smart cities such as Surat and Ahmedabad using MOOCs. In Kigali, Rwanda, the city's Open Distance and E-learning Policy (ODeL) also aims to utilize MOOCs as a key strategy to provide responsive and innovative educational programmes. Similarly, Thailand's Cyber University Project for Open Education aims to develop the Prince of Songkla University as an e-Learning hub in Phuket City, tapping on MOOCs to offer access to tech-related courses such as 3D printing, modelling, and coding. Digital platforms can help resolve constraints in funding, staffing, or teaching resources.

Formal Degree Programmes

About 15 percent of the top 50 cities have identified specific skills which could enable citizens to actively contribute to the city's smart city vision, and gone on to establish new degree programmes at higher learning institutes. For example, Vienna's Integrative Urban Development – Smart City Master's degree focuses on the development and implementation of tech-enabled integrative urban solutions. Paris's CNAM (Conservatoire national des Arts et des Metiers) also offers a Smart City Management Certificate, for graduates or working professionals looking to pursue smart city management skills such as operational skills to support digital transformation, data sharing, and communication networks. By aligning formal learning programmes with the city's smart city vision, city governments can plug any skill divide from an early stage, cultivating a new generation of young professionals for the smart industry.

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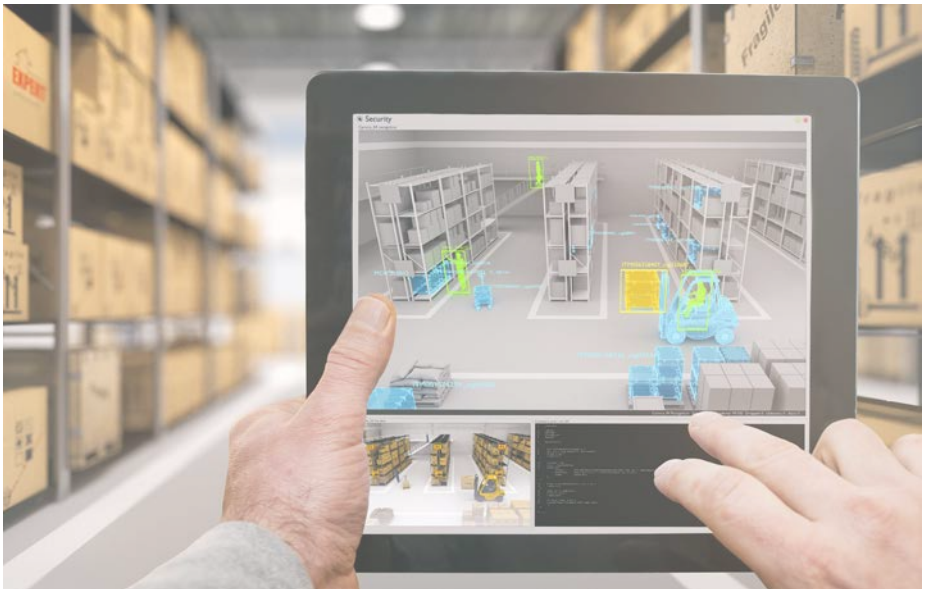
Industry Immersion

The Singapore Management University recently launched a Smart City Management and Technology Major, that matches students with internships that allow them to apply and develop smart city solutions. The Joint Master's programme in Energy for Smart Cities offered by four European universities actively engages start-ups and industrial partners to co-create feasible prototypes for urban solutions jointly with their students. This deliberate effort to partner with enterprises offers experiential learning to encourage innovation outside the school, broadening the real-world exposure for students.



"This deliberate effort to partner with enterprises offers experiential learning to encourage innovation outside the school, broadening the real-world exposure for students."

Developing a Holistic Smart Workforce Strategy

Cities are also concerned about other groups such as children, the elderly, and working professionals, who may not be interested or able to afford a degree. They are designing learning incentives such as with government grants, actively educating the public, and setting up new entities to drive talent development. Government grants such as Hong Kong's Continuing Education Fund (CEF) and Singapore's SkillsFuture program, help offset upskilling or reskilling costs. Seoul works with private education institutes to offer city-run lectures and city-funded classes that address the basics of smart technology. The City of Chicago co-founded Smart Chicago, which hosts a technology mentoring programme to teach coding skills to the youth . The Smart City Business Institute (SCBI) was set up in Barcelona to introduce "smart education" to elementary, middle, and high schools, offering hands-on workshops to help students develop mobile and robotic apps that attend to smart city challenges.

A holistic strategy therefore considers that citizens across all ages have the potential to add value and have a part to play in building a future city, enabling citizens to effectively take charge of their city.

Reflections

Which are the current and future learning needs of our city's various population groups?

•

What other non-traditional learning resources can we leverage on?

•

As we scale our learning intiatives, are we truly helping citizens acquire skills that will secure their future livelihoods?

BEYOND AFFORDABILITY & EFFICIENCY

Whether a city takes on a top-down, bottom-up, or platform approach when investing in smart technologies, a truly smart city involves much more than an infrastructure upgrade. Done correctly, smart cities have the potential to transform the character and liveability of a city, rejuvenate its economy and heritage, enhance its resilience and sustainability, and even tighten the social compact with the government and among citizens.

Diverging Priorities

While some successful smart cities like Helsinki, Beijing, and Shenzhen articulated a vision around leveraging technology to create highly-efficient cities, other cities have very different priorities. New York, for example, decided to focus on social inclusion and equity to overcome acute poverty in parts of the city. Driven by its Mayor's commitment to combat hate crime in the city, London revised its smart city strategy to safeguard the interests of its most vulnerable populations. Vancouver, Copenhagen, and Amsterdam, stemming from citizen preferences and their natural endowment, chose to prioritize eco-friendliness. Jaipur, whose GDP relies heavily on tourism, designed its smart city strategy around promoting that sector.

A few elements that successful models had in common, however, are commitments to building an environment conducive to everyone's happiness and planning for the future. A well-designed city needs to be pleasant as much as it needs to be ready for shocks and changes, while ensuring the continuity of resources for future generations. When carefully designed, technological investments hold the promise of helping cities become loveable to citizens and visitors alike.

People-Centred Design

Many leading cities such as New York, London, Wellington, Montreal, Surat, Berlin, and Melbourne place people at the centre of urban design. Melbourne has been leading the ranks of the Economist's Liveable Cities Index for the past seven years not because of the latest technology, but because technology helps the City involve citizens in the design and improvement of their day-to-day environments. Apart from public consultations, their dedicated CityLab space prototypes and tests new ideas and city services with the community. Helsinki worked with its local community to conceive its Nifty Neighbour platform where citizens can exchange services with neighbours based on their interest, skills, need, and availability. Such initiatives help these cities connect better with citizens, to develop projects that successfully increased the city's liveability.

Building Resilience

Some cities are finding an increasing need to cope with local and global changes. Edmonton, along with Rio de Janeiro, Los Angeles, New York, Washington DC, and Tokyo, presents a well-conceived vision of a resilient city. Its government believes that engaged citizens contribute to a city's resilience by helping identify risks and contributing ideas and solutions to address city issues. To engage citizens, Edmonton's easily accessible, reliable, and extensive open data portal and municipal services dashboard empower citizens to develop their own insights from the city data. The municipality, ranked first in the Open Cities Index two years in a row, makes it easy for citizens to communicate with them through multiple channels like a mobile-friendly municipality website, and a service information and request app. These initiatives have led to more than 6,500 citizens contributing regular feedback and ideas, leading to a greater government efficiency and transparency.

> *Creating a happy, well-functioning city starts with an understanding of who lives there and a listening to what their current and future concerns are.*

Sustainability as a Goal

Meaningful impact can also stem from the long-term preservation of a city's natural resources. When it comes to sustainability, cities such as Berlin, Charlotte, Hong Kong, and Singapore feature heavily. Singapore for example excels in providing efficient water management, eco-friendly transportation, and green buildings. To overcome a shortage in fresh water supply, the country reuses reclaimed water, operates rainwater catchment systems, and desalinates saltwater. To reduce pollution and crowding, the city has a "meaningful transportation" principle encouraging citizens to only take the necessary transportation method. The city restricts car ownership and provides a very well-connected and reliable public transport system, combined with bike-sharing options and pedestrian-friendly paths. Singapore is also testing a new Zero Energy Building and covering buildings with green walls, sky trellises, and atriums that maximize energy efficiency. These initiatives have helped Singapore reduce its dependence on other countries, while creating a better environment for its inhabitants.

Understanding Our Citizens

These examples are a reminder that creating a happy, well-functioning city starts with an understanding of who lives there and a listening to what their current and future concerns are. Melbourne's Chief Digital Officer Michelle Fitzgerald captured this approach by saying: "Every smart cities discussion in the city starts with one question - Who are the people coming to the city every single day to work, to live, to play and to learn?" Cutting-edge technologies can solicit admiration, but do not necessarily address a city's most pressing needs. Perhaps nowhere has it been better articulated than in Boston's playbook, which suggests that truly smart technologies help governments become "more beautiful, more delightful, more emotionally resonant, more thoughtful, and more pleasurable to interact with—not just cheaper."

Reflections

Are we intimately familiar with the patterns and challenges faced when real people and local businesses interact with the city?

•

Could the drive for affordability and efficiency sometimes overshadow equity, sustainability and our social imapct?

•

In what instances might this have led us to prioritize hardware over "heartware"?

City Stories

Developing a truly smart city is a venture demanding immense scale, complexity, and commitment. The following stories are not intended as profiles of each city, but serve as exemplars of a good practice among each of our Top 50 Smart City Governments.

1 LONDON

Investing in digital inclusion

When Sadiq Khan was elected mayor in 2016, he announced a renewed smart city vision for protecting the interests of vulnerable populations, under the Smart London 2.0 plan.

London's new plans and Vision 2020 has digital inclusion focus as a core component of its strategy.

The Smart London Board, comprised of industry experts and thought leaders, was set up to support the Mayor in visioning, strategizing, and applying smart city objectives. Additionally, the new London Office for Technology & Innovation (LOTI) was set up to understand leading practices, apply them in the city, and combine resources and expertise for collective benefit. A Chief Digital Officer was also appointed to lead digital transformation, beginning with digital inclusion.

The Greater London Authority signed the Government's Digital Inclusion Charter in early 2016. The charter's key goal is to reduce the number of people without Internet access by 20 percent across the country every two years. Overall, by 2020 the aim is to have everyone online – or with the aspiration to be online.

The city also launched the fastest free Wi-Fi in all of UK with a multi-million-dollar investment, offering fast Internet speeds at 150 points across the city.

The Mayor's Digital Inclusion Strategy uses pilot projects to aid people in getting online and empowering them with basic digital skills. One borough launched a project to test if lending Wi-Fi-enabled tablets from libraries or community centres, complemented with basic digital skills training, could lower its 10 percent digital exclusion rate. Devices are also being loaned to community groups to enable their staff, volunteers, and local communities to up-skill.

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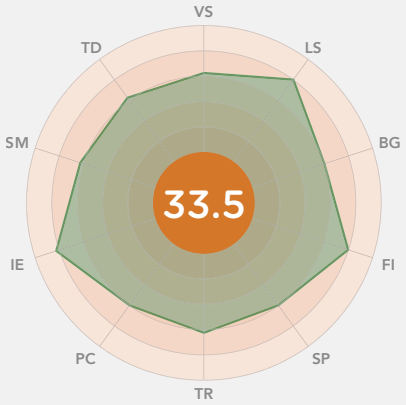
SMART CITY GOVERNMENT SCORE



VS	VISION	3.1
LS	LEADERSHIP	4.0
BG	BUDGET	3.0
FI	FINANCIAL INCENTIVES	4.0
SP	SUPPORT PROGRAMMES	3.0
TR	TALENT-READINESS	3.1
PC	PEOPLE-CENTRICITY	3.0
IE	INNOVATION ECOSYSTEM	4.1
SM	SMART POLICIES	3.1
TD	TRACK RECORD	3.1

2 SINGAPORE

Comprehensive approach from the national government

Singapore's smart city vision, driven by the Smart Nation and Digital Government Office, complements existing programmes with a USD 1.75 bn budget across four years to help its citizens live meaningful lives enabled seamlessly by technology. As a nation-state, its centralized governance allows its innovation programmes to be synthesised and aligned more easily with its vision.

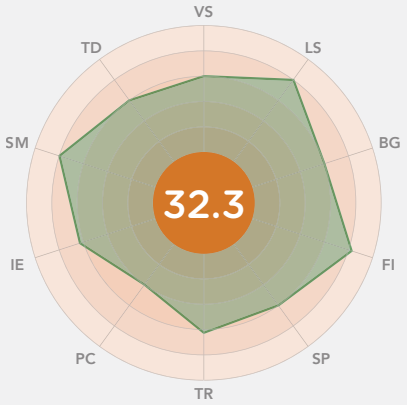
The Government has a wide variety of financial schemes to ensure that innovation efforts undertaken by small and medium enterprises (SMEs) are easy and affordable. For instance, the Productivity Solution Grant funds SMEs up to 70 percent of the costs of adopting technology in their work processes. Research and development tax incentives also help to defray costs when developing new capabilities. The newly-launched Intellectual Property Development Incentive offers tax deductions on licensing payments when intellectual property is used commercially.

The Government has also introduced programmes to encourage technology adoption and innovation amongst citizens. Its SkillsFuture programme helps to build digital capabilities in its workforce, with the Tech Skills Accelerator that has trained more than 27,000 people in data analytics, artificial intelligence, and cybersecurity. The Artificial Intelligence (AI) Apprenticeship Programme offers mentorship from experienced AI, big data, and high-performance computing professionals over nine-month long structured training programs.

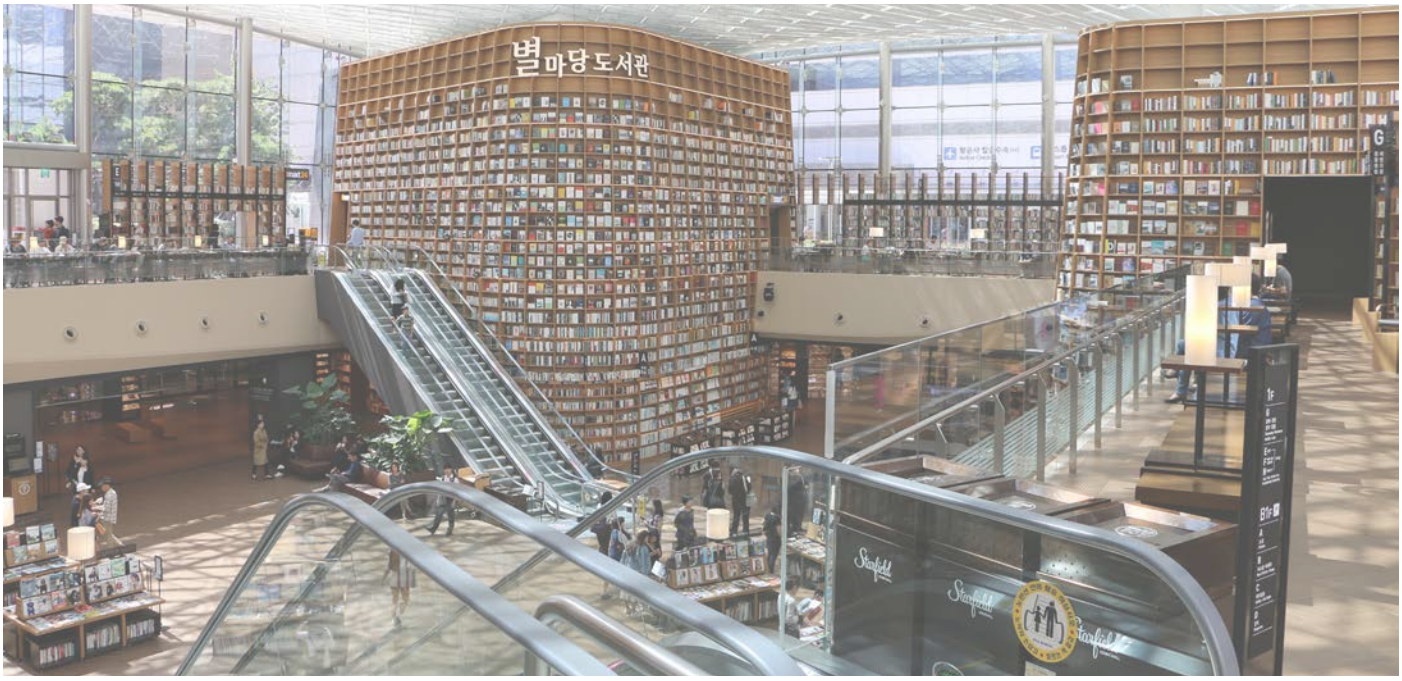
Aside from talent and innovation incentives, the City will develop two additional innovation districts, namely Punggol Digital District and the Jurong Innovation District, on top of the current one-north district that houses Block 71, home to more than 500 start-ups. The new innovation districts aim to foster new industries such as cyber-security and advanced manufacturing.

Singapore's suite of programmes caters to different stakeholders through a variety of approaches, playing a crucial role in establishing a thriving innovation ecosystem.

SMART CITY GOVERNMENT SCORE



VS	VISION	3.0
LS	LEADERSHIP	4.0
BG	BUDGET	3.0
FI	FINANCIAL INCENTIVES	4.1
SP	SUPPORT PROGRAMMES	3.0
TR	TALENT-READINESS	3.1
PC	PEOPLE-CENTRICITY	2.0
IE	INNOVATION ECOSYSTEM	3.1
SM	SMART POLICIES	4.0
TD	TRACK RECORD	3.0



3 SEOUL

From citizen-oriented to citizen-led services

The Seoul Metropolitan Government (SMG) has developed e-government initiatives that incorporate advanced Information and Communication Technology (ICT) to improve its administration's efficiency and quality when serving its citizens. Its "Global Digital Seoul 2020: Smart City Seoul with New Connectivity, New Experience" plan seeks to continue reinventing governance, to move from a citizen-oriented approach to a more citizen-led one.

In July 2013, SMG launched its Mobile Seoul website which provides 60 real-time services in 11 categories, ranging from bus and subway operations and cultural events, to employment opportunities, real estate information, and public services. Mobile Seoul allows citizens to access any GPS-linked information about their neighbourhoods including Wi-Fi hotspots, facilities for the disabled, and the status of ongoing City projects.

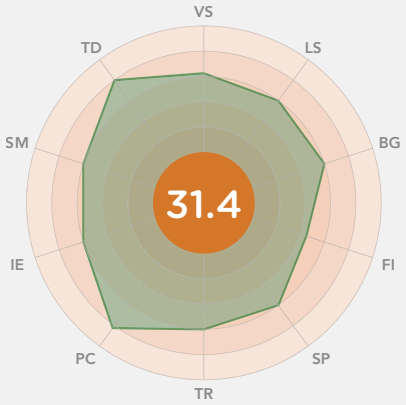
To make it convenient for citizens to provide feedback, SMG also launched a social media centre that integrates 44 of its social media accounts, Seoul Smart Complaint app, and u-Seoul Safety Service which alerts citizens of emergencies.

With a focus of becoming citizen-led, SMG released its m-Voting app in December 2013, which enables SMG to share its policies with citizens and have them vote on those that they prefer. Today, SMG sets aside about five percent of its annual public spending budget for projects which are proposed by its citizens through the app.

The Government's objective is to increase the number of voters to one million by 2020. Other City apps include FixMyStreet, which allows for community mapping and geo-tagging of issues to be flagged to the government, as well as Oasis, another platform for citizens to propose ideas to solve city issues. About 500 ideas have already been incorporated into policy changes.

Today, SMG sets aside about five percent of its annual public spending budget for projects which are proposed by its citizens through the app.

SMART CITY GOVERNMENT SCORE



VS	VISION	3.1
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BG	BUDGET	3.0
FI	FINANCIAL INCENTIVES	2.2
SP	SUPPORT PROGRAMMES	3.0
TR	TALENT-READINESS	3.0
PC	PEOPLE-CENTRICITY	4.1
IE	INNOVATION ECOSYSTEM	3.0
SM	SMART POLICIES	3.0
TD	TRACK RECORD	4.0

4 NEW YORK

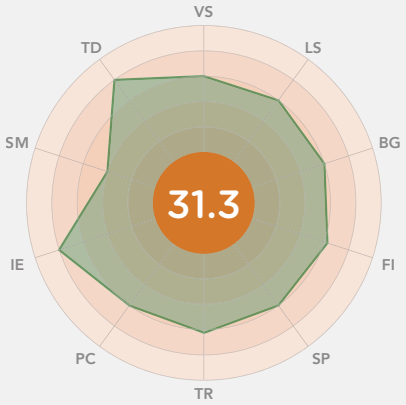
Decentralizing leadership to deal with complexity and scale

In 2007, PlaNYC set the vision of New York City through 2040 and commenced its smart city journey. Data began to be systematically collected to improve policy across ten focus areas, such as energy, climate change, air quality, and others. The current, unified city plan, OneNYC, incorporates smart city initiatives to achieve goals such as diversity and inclusivity, equity, growth, resiliency, and sustainability. As one of the world's largest, most diverse, and densely-populated cities, the wide range of focus areas for smart city applications made it impractical to establish an entirely new office dedicated to smart cities.

Mayor de Blasio instead assigned responsibility to the Mayor's Office of Sustainability and the Mayor's Office of Recovery and Resiliency to execute the provisions of the plan. Further, the Mayor's Office of the Chief Technology Officer offers a unique role of sourcing and deploying technology to realize OneNYC. These offices implement their portfolio of projects with flexibility, involving other departments and agencies as required.

Decentralizing responsibility across several offices to implement smart city solutions created many benefits, while remaining relevant to the guidance offered by the city's vision. For example, the provision of real-time bus arrival times at bus stops stayed focused on dealing with NYC's steady population growth, rather than be about simply using available technologies to increase convenience or comfort. City departments tapped into a centralized database of 18 million requests from different municipal services made through the City's 311 service hotline to improve the delivery of services. At the same time, the Offices enjoyed the flexibility and initiative to spearhead their own smart city initiatives. To ensure knowledge transfer, The Mayor's Office of the Chief Technology Officer launched NYCx, which sources tech-knowledgeable individuals to share experience and expertise when applying frontier technologies to smart city initiatives. Operating in this way, the City creates coherence among its diverse objectives, taps into the specialized expertise of its departments, and fosters a spirit of collaboration and interdependence.

SMART CITY GOVERNMENT SCORE



VS	VISION	3.0
LS	LEADERSHIP	3.0
BG	BUDGET	3.0
FI	FINANCIAL INCENTIVES	3.1
SP	SUPPORT PROGRAMMES	3.0
TR	TALENT-READINESS	3.1
PC	PEOPLE-CENTRICITY	3.0
IE	INNOVATION ECOSYSTEM	4.0
SM	SMART POLICIES	2.0
TD	TRACK RECORD	4.1

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5 HELSINKI

Co-creating "the world's most functional city"

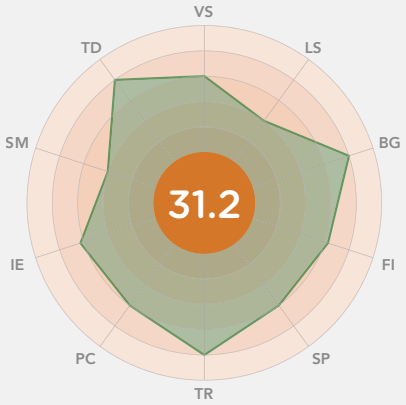
The City of Helsinki vision is to become the world's most functional city, fulfilling the pressing needs of citizens. Helsinki identifies the citizen needs and the direction of its smart city development via open government and transparent policies. Forum Virium Helsinki, the innovation division of the City, attributes the City's achievements to its "underlying basic philosophy of the transparency of public information." The Mayor holds regular meetings for residents in different parts of the city, hosts live webcasts of City Council meetings, and allows citizens to appeal municipal decisions.

Apart from local co-creation platforms, competitions, and bootcamps, Helsinki also actively shares learnings among five other Finnish cities on the 'The Six City Strategy' open innovation platform, as well as with other European cities through Horizon 2020 projects, EIT Digital, and the EIT climate-kic. Of special interest is Helsinki's smart innovation district Kalasatama, which has welcomed 1,500 innovation tourists in the last two years who have come to study Helsinki's model.

Kalasatama's aim is to save one hour of every citizen's time every day with smart traffic-related services. It heavily involves its local communities in smart city developments; more than 800 of its 3,000 residents directly worked on the Kalasatama project. A wide range of stakeholders including city departments, residents, citizen organizations, industry, SMEs, start-ups, and academia worked together using open data to experiment with smart and clean services that can be scaled up elsewhere. As a result, more than 25 innovative infrastructure, buildings, and experimentation projects are being developed.

Similar to Kalasatama's operational model, the services born in the smart district also embody communal participation and support. One example is the locally conceived Nifty Neighbour platform where citizens can exchange services such as accompanying the elderly next door for a walk and helping a neighbour to sew clothes. Smart initiatives in the city are not only driven by Kalasatama; Smart & Clean Helsinki Metropolitan, for example, is a foundation that testbeds smart and clean solutions in Helsinki's metropolitan area. Forum Virium Helsinki is working with residents and dietitians to pilot a mobile platform, Kalasatama Wellbeing, that will allow citizens to record their diets and receive immediate dietary advice.

SMART CITY GOVERNMENT SCORE



VS	VISION	3.0
LS	LEADERSHIP	2.0
BG	BUDGET	4.0
FI	FINANCIAL INCENTIVES	3.1
SP	SUPPORT PROGRAMMES	3.0
TR	TALENT-READINESS	4.0
PC	PEOPLE-CENTRICITY	3.0
IE	INNOVATION ECOSYSTEM	3.1
SM	SMART POLICIES	2.0
TD	TRACK RECORD	4.0

6 MONTREAL

Smart platforms for transparency and democracy

Montreal's smart city strategy is infused with democratic principles that translate into transparent and accessible data sharing, and collaborative public spaces promoting the involvement of all stakeholders in the city's decisions.

The city established several two-way channels to involve its citizens in the design of the city and collecting a representative amount of insights from its citizens. Citizens of Montreal are able to communicate their views on the city's ongoing policy decisions through dedicated forums for public discussions. In developing their Smart City plan, the city organized town hall meetings and recorded suggestions from participants, conducted four surveys involving over 7,000 respondents, analyzed over 1 million requests by Montrealers through the Montreal one-stop number "311 service", and collected 357 citizen ideas from the suggestion box on the Montreal Website.

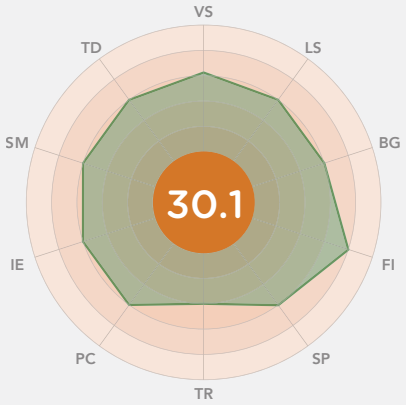
Montreal has 14 ongoing 'Participatory Democracy' projects under its Smart City Action Plan. The city reaffirms its will to promote a culture of transparency and accountability by democratizing knowledge. The city has an "Open by default" data policy accompanied by measures to protect privacy and public security. Montreal has already liberated 233 data sets on its website and is aiming at publishing 800 data sets by December 2018. The city is also working on developing new tools to make its key performance indicators for its budget, project monitoring, and service level targets, available to the public.

In 2016, Montreal ranked 3rd in the Open Cities Index. These efforts to democratize the creation of the smart city make Montreal one of the most open and inclusive cities in the world.

"The empowerment of stakeholders should be the key focus in creating a strong smart city ecosystem. This could involve changing the regulatory framework to ease testing, changing procurement processes and providing funding for projects."

Stephane Guidoin
Interim Director of Montreal Urban Innovation Lab

SMART CITY GOVERNMENT SCORE



VS	VISION	3.1
LS	LEADERSHIP	3.0
BG	BUDGET	3.0
FI	FINANCIAL INCENTIVES	4.0
SP	SUPPORT PROGRAMMES	3.0
TR	TALENT-READINESS	2.0
PC	PEOPLE-CENTRICITY	3.0
IE	INNOVATION ECOSYSTEM	3.0
SM	SMART POLICIES	3.0
TD	TRACK RECORD	3.0

7 BOSTON

Meeting the real needs of residents

Boston believes that a truly smart city should allow its residents to define what exactly "smart" means to them. For City officials, a smart city should feel like a home to its inhabitants, and not like a laboratory. As explained in the City's Playbook, the municipality's goal is to "make government more beautiful, more delightful, more emotionally resonant, more thoughtful, and more pleasurable to interact with, not just trying to make it cheaper."

In that spirit, the City launched a civic experimentation called Beta Blocks. This initiative aims to build more meaningful relationships between communities faced with a challenge, and the companies, researchers, and designers that could provide solutions. To that end, the City and its partners plan to engage the public, host smart city public discussions, work with communities to deploy innovative street-level solutions, create a matching platform for experiments, and design enabling policies. Beta Blocks already started to engage Boston residents by organizing a Robot Block Party for 4,500 participants, to discuss artificial intelligence, autonomous vehicles, and robotics.

Boston's focus on citizen-centricity is also evident in its Smart City Playbook. Addressed to the tech companies, scientists, and researchers who make up the smart city community, this playbook stresses the importance of "solving real problems for real people". It encourages this community to talk to Boston's inhabitants, architects, and advocacy groups – and design around their needs and experiences – before approaching the mayor's office with their smart city solutions.

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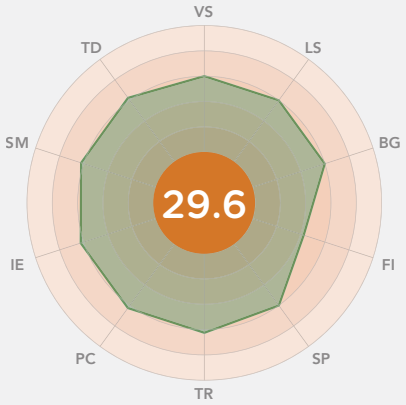
SMART CITY GOVERNMENT SCORE



VS	VISION	3.0
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BG	BUDGET	3.0
FI	FINANCIAL INCENTIVES	2.1
SP	SUPPORT PROGRAMMES	3.0
TR	TALENT-READINESS	3.1
PC	PEOPLE-CENTRICITY	3.1
IE	INNOVATION ECOSYSTEM	3.1
SM	SMART POLICIES	3.1
TD	TRACK RECORD	3.1

8 MELBOURNE

Developing a deep understanding of citizen needs

In Melbourne, every smart city conversation begins with the question, "Who are the people coming to the city every single day to work, to live, to play, and to learn?"

In order to ensure they design for the exact citizen need and avoid devising solutions in haste, the city involves citizen users of a particular solution using human-centred design tools. Citizens work closely with officials to develop future-proof solutions at CityLab, a prototyping lab housed in the Melbourne Town Hall. The core principle is to maximize community engagement, and use rapid prototyping and design thinking to move quickly using minimal resources.

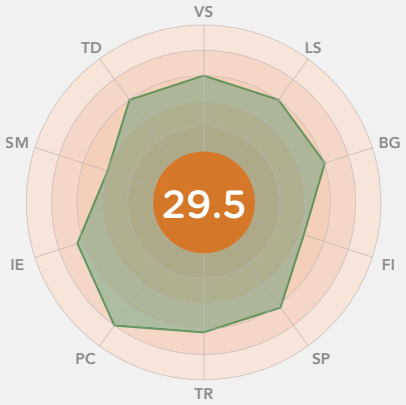
Melbourne's process of re-designing public services with citizens offers a popular example. The City conducted in-depth research to understand how blind, deaf, or deaf–blind people navigate their way through the city. The City partnered with Vision Australia, a private company, to trial a technology that transmits location-specific information to help these citizens navigate the city independently.

The City also launched an Open Accessibility Programme. Collaborating with the City's Disability Advisory Committee, they identified areas for improvement and chose datasets to be shared with participants. Innovators, entrepreneurs, and businesses came together to compete for cash prizes, incubator sessions, and offers from Accenture and Microsoft to co-create and scale winning solutions further. The winning idea integrated the city's open data with smart assistants like Google Assist and Amazon Alexa, to provide updated information through voice, text, as well as screen readers, offering people with disabilities the opportunity to participate in every realm of city life.

"We recognise that citizen involvement is crucial if progress is to be made. People are the centre of our work and our Smart City Office is a key platform through which we work to unite and empower Melbourne's citizens, businesses and industries."

Councillor Dr. Jackie Watts
Knowledge City Potfolio Chair - City of Melbourne

SMART CITY GOVERNMENT SCORE



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BG	BUDGET	3.0
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SP	SUPPORT PROGRAMMES	3.1
TR	TALENT-READINESS	3.1
PC	PEOPLE-CENTRICITY	4.0
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SM	SMART POLICIES	2.0
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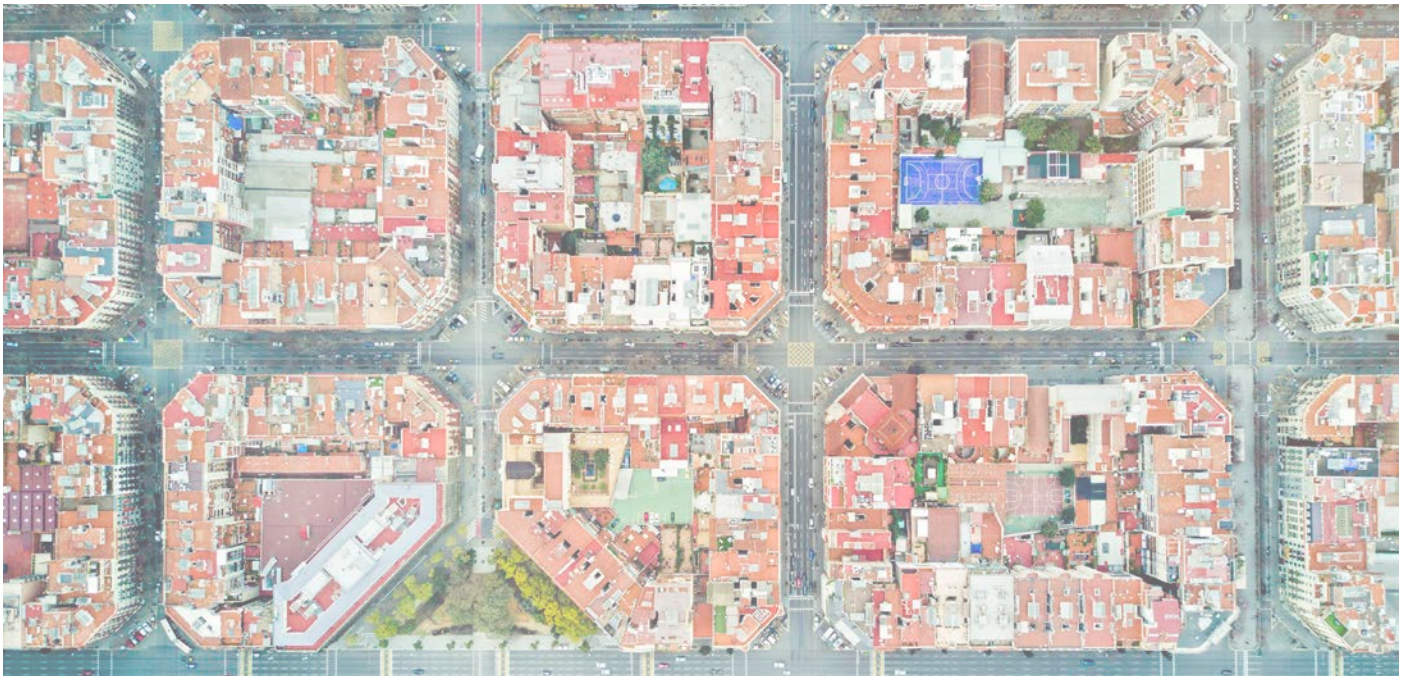

9 BARCELONA

Returns on smart city investments

Barcelona declared its intentions to become the most connected city in the world and it is following through on its promise by investing considerably in IoT applications for the city. Barcelona is finding multiple benefits to connecting devices and collecting a plethora of data that can be translated into meaningful insights to guide the city's daily decisions. Ultimately, the city is hoping to cut costs and increase social welfare by managing its resources more efficiently and using data to inform its investment decisions. The World Health Organization dedicated an entire study on Barcelona's IoT powered services and concluded that "IoT-powered smart cities stand better chances of becoming healthier cities.

The City installed Smart LED lamps equipped with sensors that only light up when movement is detected. The initiative allowed them to save 30 percent in energy. The sensors also capture a range of data from noise level to air pollution and humidity levels, which is later used to inform the City's decisions. According to Cisco's estimates, Barcelona's current smart city investments should return a cumulative economic benefit of USD 970 mn by 2026. So far, Barcelona's IoT systems have saved the city an estimated USD 58 mn on water, generated USD 50 mn per year in parking revenues and generated 47,000 new jobs. The city is now building one operating system that would run the entire city on a single interface. In pursuing such technology-driven upgrades, Barcelona hopes to serve as a model for other cities in technology-led urban transformation and city management. The City continues to revise its goals with every milestone it achieves and to pave the way for other cities to invest in IoT.

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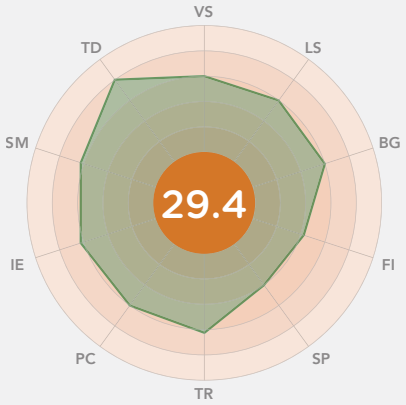
SMART CITY GOVERNMENT SCORE



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LS	LEADERSHIP	3.0
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SP	SUPPORT PROGRAMMES	2.0
TR	TALENT-READINESS	3.1
PC	PEOPLE-CENTRICITY	3.0
IE	INNOVATION ECOSYSTEM	3.1
SM	SMART POLICIES	3.1
TD	TRACK RECORD	4.0

10 SHANGHAI

Integrating Big Data from public and private sources

Shanghai envisions a global digital smart city driven by big data, to provide digital public services and make intelligent urban management decisions.

Public services in the city have undergone rapid, large-scale digitalization, supported by the accessible and extensive telecommunication infrastructure in Shanghai. In 2017, Shanghai achieved 100 percent city-wide optical fibre coverage. In the same year, Shanghai moved more than 200 public service information systems to the cloud and piloted data-sharing across different government departments. In addition, the municipal public service data-sharing platform is connected to the national public service data-sharing platform. The virtual public service hall of Shanghai has served more than 10 million incidents since going online. 100 types of municipal administrative approvals and more than 700 types of district administrative approvals can also be processed online.

The combination of these digitization efforts and the application of big data analytics has further transformed public services in Shanghai. Public healthcare institutions in Shanghai share their databases to form the largest personal health data centre in China, storing over 30 bn clinical records. Health data analytics is also playing a critical role in adjusting Shanghai's health service prices and evaluating the quality of public hospitals.

Private companies in Shanghai share open data with the government to derive insights for urban management. Shared-bike operator ofo shares the location, distribution data and utilization heatmaps with the Government. The data allows the City to identify crowded areas and communicate with the company to optimise bike redistribution. In addition, big data analysis of rider behaviours can inform the Government about the current gaps in public transport capacity and support new bus route planning.

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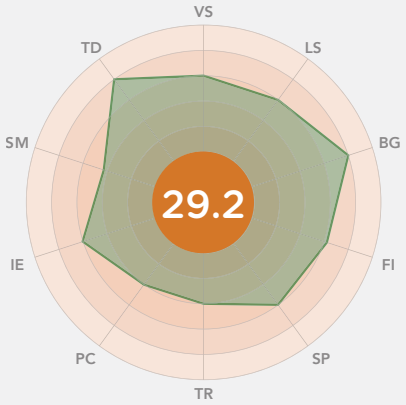
SMART CITY GOVERNMENT SCORE



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BG	BUDGET	4.0
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SP	SUPPORT PROGRAMMES	3.0
TR	TALENT-READINESS	2.0
PC	PEOPLE-CENTRICITY	2.0
IE	INNOVATION ECOSYSTEM	3.0
SM	SMART POLICIES	2.1
TD	TRACK RECORD	4.0

11 SAN FRANCISCO

Data policies help encourage citizen participation

San Francisco residents are well-known for their commitments to sustainability, which the City recognizes as one of the population's highest ambitions. At the same time, residents face severe traffic-related challenges. Together, these two citizen-focused imperatives provided the basis for the City's smart city direction. As a cross-departmental collaboration with the San Francisco Department of the Environment and the San Francisco Municipal Transportation Agency, the City outlined a comprehensive and specific vision with accompanying, memorable goals.

The bottom-up approach the City took further accommodated the high premium residents place on data privacy. A dedicated Chief Data Officer (CDO) navigated the complexity of obtaining practical insights from collecting and sharing data, while building trust, assurance, and understanding among data owners — the residents themselves.

The CDO developed a toolkit to help departments update data policies, to reflect a more contemporary understanding of data protection. In turn, City departments put their new, as yet untested policies into practice, to better understand their real-world applications and implications. Officials iterated data privacy policies using this learning loop, which helped to increase the pool of useful data while protecting residents' privacy concerns.

The City enjoys residents directly involving themselves in identifying, developing, and rolling out smart city initiatives. Non-profits like Joint Venture Silicon Valley develop and submit plans to the City for consideration and implementation, including proposals for smart traffic management. The Mayor's Office of Civic Innovation dedicates its work to engage the public in innovation. Through these mechanisms, the City solicits, facilitates, and collaboratively tackles the aspirations and challenges of San Francisco residents.

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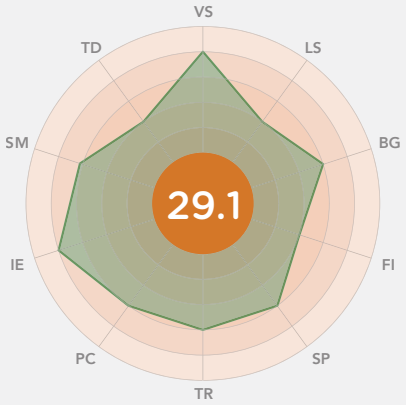
SMART CITY GOVERNMENT SCORE



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SP	SUPPORT PROGRAMMES	3.0
TR	TALENT-READINESS	3.0
PC	PEOPLE-CENTRICITY	3.0
IE	INNOVATION ECOSYSTEM	4.0
SM	SMART POLICIES	3.1
TD	TRACK RECORD	2.0

12 VIENNA

The future of energy in a smart district

In 2013, the City of Vienna partnered with energy providers and power grid operator Siemens to create one of the largest urban development projects in Europe. Based in the district of Aspern, this project was called Aspern Smart City Research (ASCR). With a budget of USD 44.6 mn and 240 hectares set to welcome 20,000 residents by 2030, the project is a living laboratory to research the future of energy under real-life conditions.

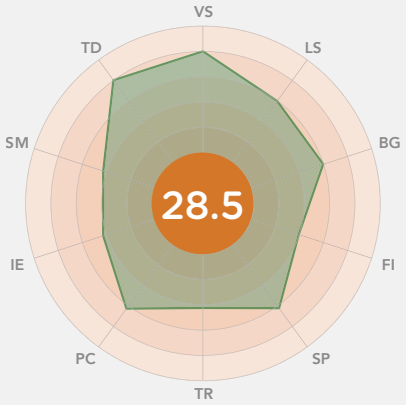
After collecting and analyzing data from the district's smart grid, smart buildings, smart technology, and smart users, ASCR develops solutions for future urban development, energy planning, and living comfort. Households are equipped to capture data; sensors measure humidity, temperature, as well as heat, water, and power consumption. In addition to households, solar-power units, energy storage systems, and heat pumps continuously transmit information on their operational status. The project, which currently houses around 6,000 inhabitants, generates 1.5 million data sets every day.

Experts then use structured data analysis to find patterns in the data and answer a list of 200 questions about carbon emissions and energy efficiency, such as "How can urban buildings efficiently take part in the energy market?" and "How will this impact grid operators?". By answering such questions, Vienna hopes to meet its ambitious goal of reducing per capita greenhouse gases to 80 percent of 1990 levels.

ACSR is on track to achieve its environmental goals through smart technologies. In 2016, it was voted the World's Best Smart Project at the Smart City Expo World Congress in Barcelona.

With a budget of USD 44.6 mn and 240 hectares set to welcome 20,000 residents by 2030, Vienna's smart district is a living laboratory to research the future of energy under real-life conditions.

SMART CITY GOVERNMENT SCORE



VS	VISION	4.0
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BG	BUDGET	3.0
FI	FINANCIAL INCENTIVES	2.0
SP	SUPPORT PROGRAMMES	3.1
TR	TALENT-READINESS	2.1
PC	PEOPLE-CENTRICITY	3.1
IE	INNOVATION ECOSYSTEM	2.1
SM	SMART POLICIES	2.1
TD	TRACK RECORD	4.0

13 AMSTERDAM

Smart city expertise from an online academy

Amsterdam Smart City (ASC) is a public-private partnership involving government, knowledge institutions, companies, and residents. It aims to become the largest smart city innovation platform in Amsterdam by listing all projects and actors in its smart city ecosystem, connecting communities to share expertise, and accelerating and strengthening new projects that make the city future-ready. To effectively share expertise, ASC partnered with the Amsterdam University of Applied Sciences to create the Smart City Academy.

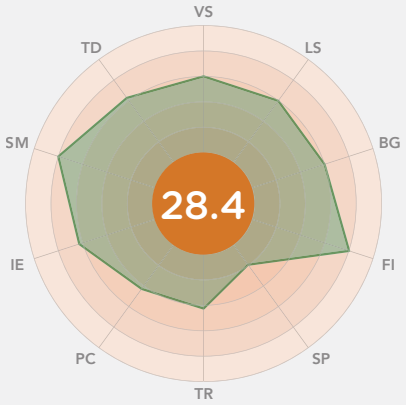
Professors, teachers, and students at the Academy investigate and share insights online about the initiation, management, and collaboration of smart city projects. These contributors also provide information and research about the overall impact and enabling conditions of smart city projects. To share their experience, they develop and make available smart city tools and methodologies online, and organize events and masterclasses, where members of the public can learn from Amsterdam's smart city projects in energy, mobility, and the circular economy.

Other areas of knowledge that are accessible online include the dimensions and conditions of scaling up smart city pilot projects, the role of larger companies within the smart city ecosystem, the challenges associated with open data, and how smart cities can transform citizenship. External contributors can also participate by publishing their own research and theses on the academy's online sharing platform.

ASC not only aims for local impact; it actively shares knowledge with other cities that are willing to learn from its experience. It does so by offering regular presentations and tours of Amsterdam's smart city initiatives for national and international delegations.

Professors, teachers, and students at the Smart City Academy investigate and share insights online about the initiation, management, and collaboration of smart city projects.

SMART CITY GOVERNMENT SCORE



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PC	PEOPLE-CENTRICITY	2.1
IE	INNOVATION ECOSYSTEM	3.1
SM	SMART POLICIES	4.0
TD	TRACK RECORD	3.1

14 SHENZHEN

Acquiring smart talent

In its smart city development, Shenzhen aims to strengthen its manufacturing industry to integrate with and benefit from the digital industry. It plans to incubate two to three multi-billion smart manufacturing clusters by 2020. With migrants constituting nine out of every eleven residents, the City also recognizes the need to use both financial and policy incentives to acquire skilled talent for its high-end manufacturing, technology, and research industries.

Shenzhen's talent policy targets a broad range of professionals, from Nobel laureates who will lead science and technology research in Shenzhen, to university graduates who form the backbone of Shenzhen's technology industry. Up until February 2018, Shenzhen has funded eight laboratories – named after foreign Nobel Prize winners – with USD 15.4 mn, and aims to build a supportive research ecosystem. Selected international talent enjoy a range of benefits including multi-entry visas, assistance for family migration, tax relief, as well as citizen-like medical care, public education, housing, and child education benefits. The City also offers housing allowances for university graduates from other Chinese cities to resettle in Shenzhen.

In 2017 alone, Shenzhen attracted an additional 263,000 professionals, including 18,300 students trained abroad. Today, it is home to high-end manufacturers and technology companies including Foxconn, Huawei, and Tencent. Led by more than 500 experts awarded with Special Government allowances of the State Council and nearly 30 full-time academicians, the city's five million skilled workers play an important role to advance its smart manufacturing and technology clusters.

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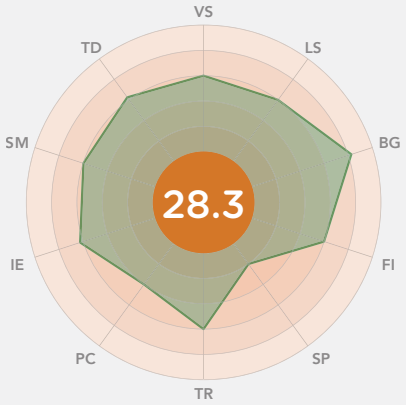
SMART CITY GOVERNMENT SCORE



VS	VISION	3.0
LS	LEADERSHIP	3.0
BG	BUDGET	4.1
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SP	SUPPORT PROGRAMMES	1.0
TR	TALENT-READINESS	3.0
PC	PEOPLE-CENTRICITY	2.0
IE	INNOVATION ECOSYSTEM	3.1
SM	SMART POLICIES	3.0
TD	TRACK RECORD	3.1

15 STOCKHOLM

Bold dreams for smart city inspiration

Most cities in this ranking have a clear smart city strategy with specific objectives, such as a percent reduction in energy consumption, to broad goals, such as providing the highest quality of life to residents. Beyond its smart and connected city strategy, Stockholm used a research method called Design Fiction to imagine the city's development. This method aims to explore futures by creating speculative – and often provocative – scenarios about the future.

Reflecting on questions like "How will we commute to work?" or "How will we live?", the City designed a brochure depicting Stockholm in 2040, called "Welcome to the world's smartest city". This brochure, produced through workshops and dialogues with city employees, school pupils, academia, and businesses, aims to inspire and spark discussion around a possible future in a digitized Stockholm.

In Stockholm 2040, the public transport fleet comprises close to 100,000 bicycles, kick-bikes, hoverboards, and electric rickshaws. Public offline zones exist, where all virtual reality equipment, facial recognition technology, and digital advertising are blocked. When it comes to education, the city's learning materials adapt to each student's strengths and weaknesses, stress level, physical conditions, and learning pace.

Some elements of Stockholm's 2040 vision are even bolder: Scent markers that guide travellers; Firefly drones that light up parks and streets; Students that graduate entirely through subliminal learning; and Autonomous mussel farms that clean the water. The brochure even features a hypothetical interview with a future 110-year-old Stockholmer!

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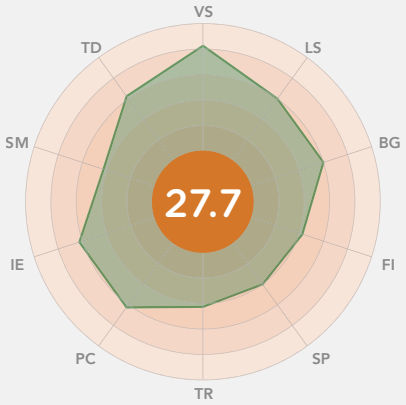
SMART CITY GOVERNMENT SCORE



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SP	SUPPORT PROGRAMMES	2.0
TR	TALENT-READINESS	2.1
PC	PEOPLE-CENTRICITY	3.1
IE	INNOVATION ECOSYSTEM	3.1
SM	SMART POLICIES	2.1
TD	TRACK RECORD	3.1

16 TAIPEI

A living lab for crowd-sourced smart city projects to commercialize

The politically- and socially-active citizenry, coupled with the strong electronics industry in Taiwan, provide fertile ground for bottom-up smart city solutions in its capital city. Taipei envisions the city as a "living lab", where the Government provides non-financial resources to activists and innovators to experiment with smart city solutions.

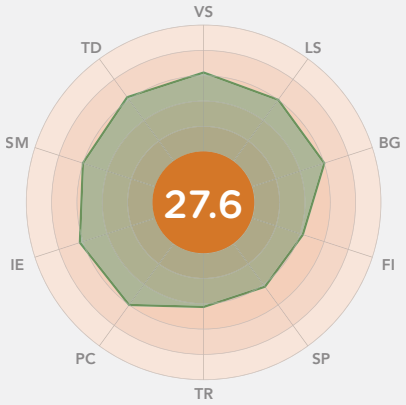
Taipei's Smart City Project Management Office (TPMO) was founded in 2016 to act as a bridge between suppliers of smart city solutions, citizens, and government agencies. Even though TPMO operates without an allocated budget to directly fund projects, it provides space and consultancy for smart city ideas and proposals from the public, and coordinates centrally-planned projects. Currently, more than 130 projects proposed by the public have been implemented in the city. For example, AAEON and Asus developed Air Boxes which monitor temperature, humidity, and air pollution in real-time. Instead of funding the research or commercialization of the Air Boxes, the City allowed the companies to install Air Boxes in elementary schools as a pilot. The successful pilot proved the usefulness of the Air Boxes, and helped the companies to further scale and export its products. The "Living Lab" environment creates a platform for innovators to refine their prototypes, develop use cases, and establish a brand name locally before expanding overseas.

Taipei works around a limited budget by setting policies that secure alternative financing channels for smart city development. For example, the City requires developers of public housing to allocate an additional three to five percent of the construction budget to smart facilities and services, including smart water and electricity meters, smart grid and smart parking lots.

"Taipei envisions the city as a 'living lab', where the Government provides non-financial resources to activists and innovators to experiment with smart city solutions."

Taipei City
Smart City Project Management Office

SMART CITY GOVERNMENT SCORE



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BG	BUDGET	3.0
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SP	SUPPORT PROGRAMMES	2.1
TR	TALENT-READINESS	2.1
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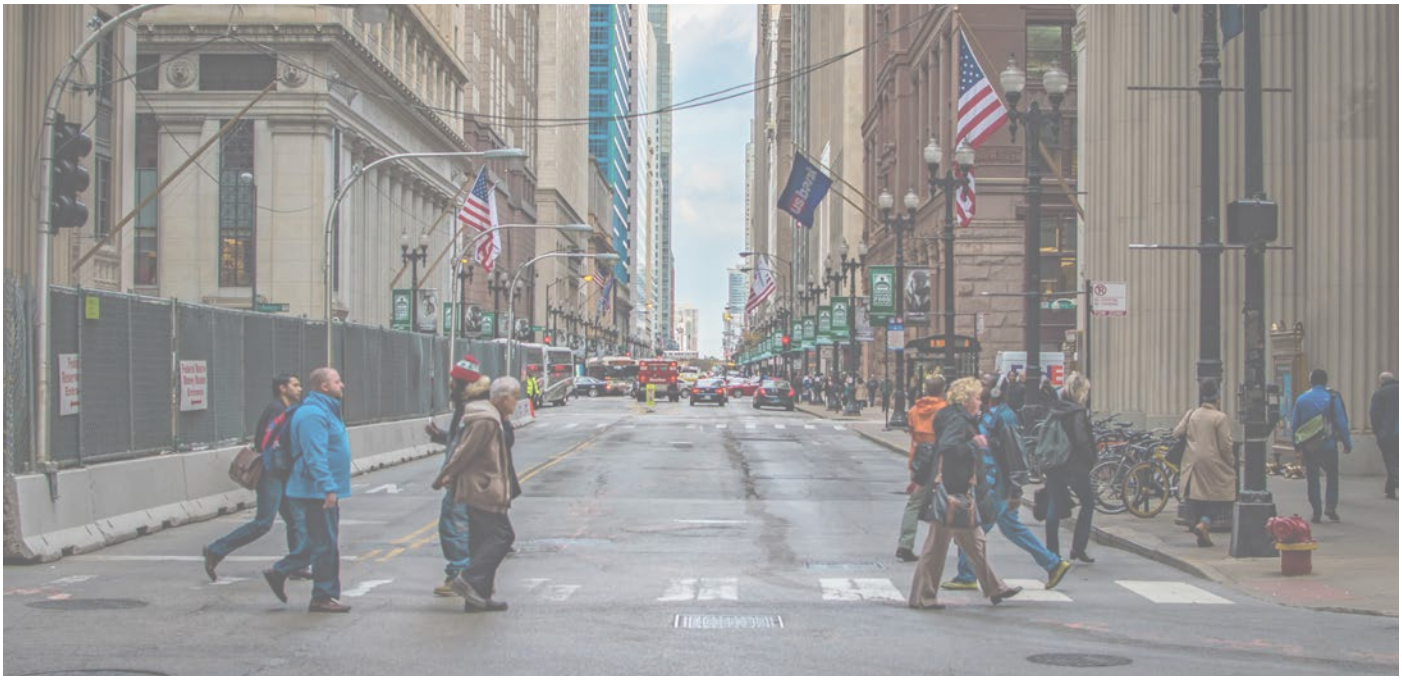
IE	INNOVATION ECOSYSTEM	3.1
SM	SMART POLICIES	3.0
TD	TRACK RECORD	3.1



17 CHICAGO

Engaging society with technology

Chicago took a data-centric approach to enable participation of all segments of society when developing its smart city initiatives. The Chicago Tech Plan strongly emphasizes data's role and commits to five data-related actions: Establish next-generation infrastructure; Ensure full participation of residents and businesses; Leverage data and new technology; Work with civic technology innovators; and Encourage vibrancy of the technology sector. The City subsequently provided an 18-month update detailing numerous quantitative outcomes from the plan's 28 imperatives.

The plan's wide scope paved the way for a variety of partnerships across the city. Notably, the Urban Center for Computation and Data (UrbanCCD) — itself a result of a collaboration between the Argonne National Laboratory and the University of Chicago — partnered with the City of Chicago to install a total of 500 sensor nodes throughout the city to collect a variety of Array of Things (AoT) data. AoT data would enable the City, researchers, innovators, and citizens alike to identify and justify specific ideas and initiatives to implement.

Chicago's AoT stimulated many civic initiatives that tackled problems together with large groups of stakeholders. The Smart Chicago Collaborative, another public-private partnership focused on civic participation and improvement through technology, has created spaces for public engagement.

Beyond educating the public on AoT, Smart Chicago solicits ideas, concerns, expectations, and opportunities from the public for collaboration. A civic hacker group called Open Chicago also organizes hackathons to gather developers and businesses together to use open data platforms including AoT.

Finally, UrbanCCD created a platform called Lane of Things, to integrate the data from AoT into the education system to teach data analytics skills to high school students.

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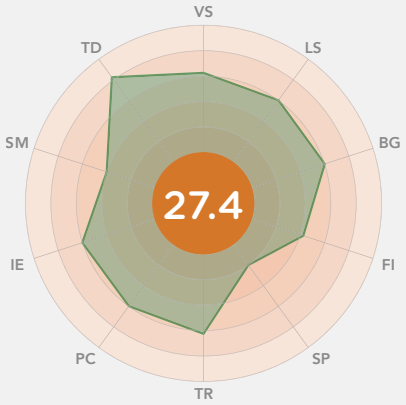
SMART CITY GOVERNMENT SCORE



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PC	PEOPLE-CENTRICITY	3.0
IE	INNOVATION ECOSYSTEM	3.0
SM	SMART POLICIES	2.0
TD	TRACK RECORD	4.1

18 SEATTLE

Open by default vs. open by preference

The City of Seattle was strategic and deliberate in their approach to introducing an open data platform. Instead of having an "open by default" policy, the City practices an "open by preference" policy. With this method, the City ensures that the collected data is reviewed by officials and approved as safe for publishing before it is made available to the public.

Seattle was inspired to adopt the new policy upon observing New York's struggle with their first privacy-related open data issue; a software engineer had managed to re-identify the anonymized license numbers of taxis and drivers published by the New York City Taxi and Limousine Commission and used it to track celebrities. While the incident of retrieved information in New York was considered harmless, Seattle still saw value in the initiative.

The city chose to be proactive about it and to re-evaluate its own policies to prevent such misuse of open data. It assigned a team of experts to analyze it to foresee potential scenarios of misuse and protect its citizens' right to privacy. The office of the mayor also announced that it will annually re-evaluate the risks associated with running an open data program.

Seattle, like most cities, is still debating what forms of information must be kept private, and what must be shared to advance research and enable innovative problem solving like during hackathons. However, the open by preference policy is one effective way to reduce risks until more effective methods are developed.

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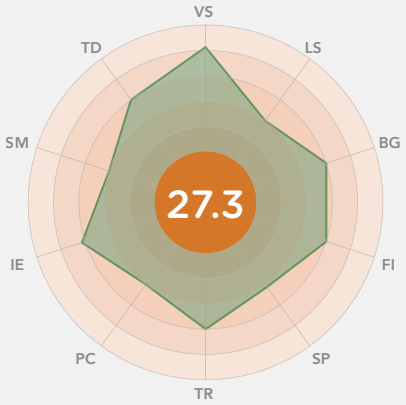

VS	VISION	4.1
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BG	BUDGET	3.0
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SP	SUPPORT PROGRAMMES	2.1
TR	TALENT-READINESS	3.0
PC	PEOPLE-CENTRICITY	2.0
IE	INNOVATION ECOSYSTEM	3.1
SM	SMART POLICIES	2.0
TD	TRACK RECORD	3.0

18 HONG KONG

Enhancing productivity of smart industries

Hong Kong seeks to upgrade traditional industries with technology, to boost productivity growth in efforts to remain as a competitive destination for global enterprises and talents. The Government provides funding to drive the development and adoption of new technologies in various industries.

SMEs were identified with the most pressing need for technological upgrade among businesses facing rising costs and shortage in manpower. In 2014, the Hong Kong Government allocated USD 6.4 mn for the Retail Technology Adoption Assistance Scheme for Manpower Demand Management (ReTAAS), to encourage local retail SMEs to adopt technological solutions, such as inventory systems, electronic payment systems and Radio-frequency identification (RFID) systems. Small retailers of clothing, food and beverages, and electronics benefited the most from ReTAAS as the technological upgrade helped to cushion the impact of rising labor costs.

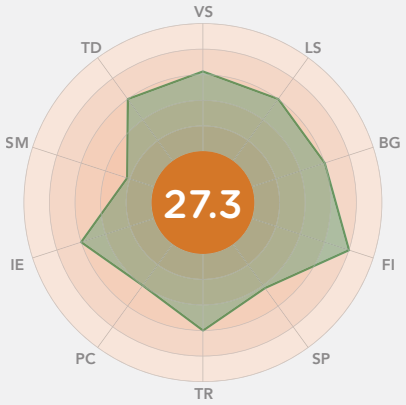
The Hong Kong Government also encourages technology upgrading among large companies. The Government set up the Construction Innovation and Technology Fund to promote the adoption of technologies, including Building Information Modelling, prefabricated steel reinforcement components, and Modular Integrated Construction, to enhance productivity, reduce environmental impact and improve safety of construction sites.

Besides funding businesses, the Hong Kong Government also invests heavily in innovation infrastructure, such as the establishment of its Hong Kong Science Park (HKSTP) which hosted Hong Kong's first tech unicorn and incubated more than 540 start-ups since its inception. The City also allocated USD 2.3 bn to establish the Lok Ma Chau Loop at the city's border with Shenzhen, to accommodate the largest science park in Hong Kong and to spearhead technological innovation in the Guangdong-Hong Kong-Macao Bay Area.

"We hope to make use of innovation and technology to address urban challenges, enhance the effectiveness of city management and improve people's quality of living as well as Hong Kong's sustainability, efficiency and safety."

Office of the Government Chief Information Officer

SMART CITY GOVERNMENT SCORE



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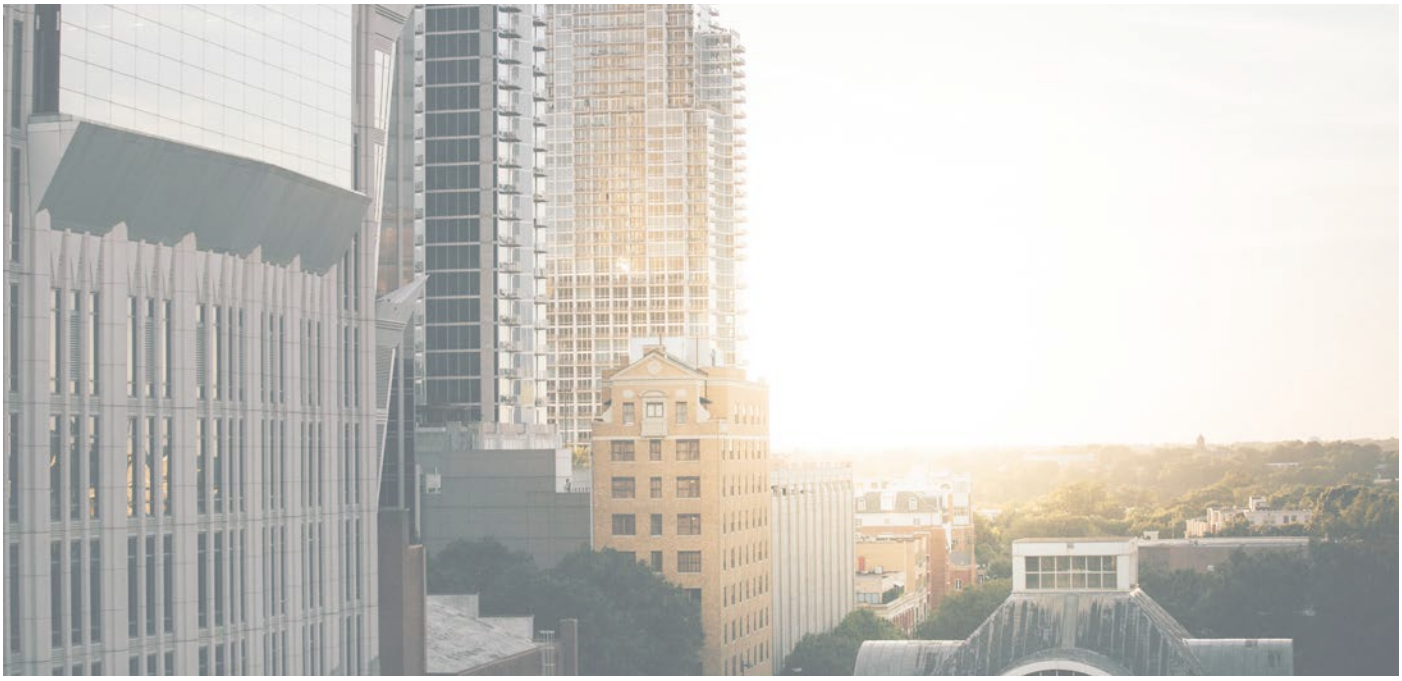
FI	FINANCIAL INCENTIVES	4.0
SP	SUPPORT PROGRAMMES	2.1
TR	TALENT-READINESS	3.0
PC	PEOPLE-CENTRICITY	2.0
IE	INNOVATION ECOSYSTEM	3.0
SM	SMART POLICIES	1.1
TD	TRACK RECORD	3.0



20 CHARLOTTE

Increasing scale and scope with 3P partnerships

Charlotte, North Carolina began its smart city journey in 2010 with Envision Charlotte, a public-private collaboration between the local energy provider, Cisco, and Charlotte Center City Partners. It was tasked with increasing the city centre's energy efficiency. The cross-section knowledge of the energy sector, technology, and economic development imperatives through this partnership combined educational initiatives, facility management good practices, and impact evaluation to achieve a 19 percent reduction in energy consumption since its inception.

The attention given to quantifiable metrics enabled the collaboration to track the effectiveness of projects, revise their approaches, or discontinue them if they did not achieve desired outcomes. The collaboration then launched a new "Smart Energy in Offices" initiative, to equip the wider state with smart city good practices, technology, tools, and approaches to reduce commercial energy consumption. As a result of its renowned success, the collaboration subsequently created Envision America to share knowledge among experts, partners, and other cities.

Drawing on experience from this public-private partnership, Charlotte has expanded its smart city portfolio beyond energy management. The City designated the North End Smart District (NESD) as a comprehensive first step to piloting smart city initiatives on a large scale, engaging and partnering with community leaders and residents, companies and entrepreneurs, non-profits, and City departments.

The City launched a community-driven, state-of-the-art learning lab that provides internet access, technology education, and digital literacy programs to foster community engagement in devising and participating in smart city projects. As residents build capacity and develop ideas to advance the district, ideas become executed with the NESD's partners.

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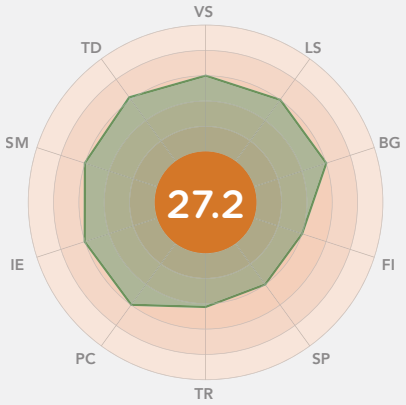
SMART CITY GOVERNMENT SCORE



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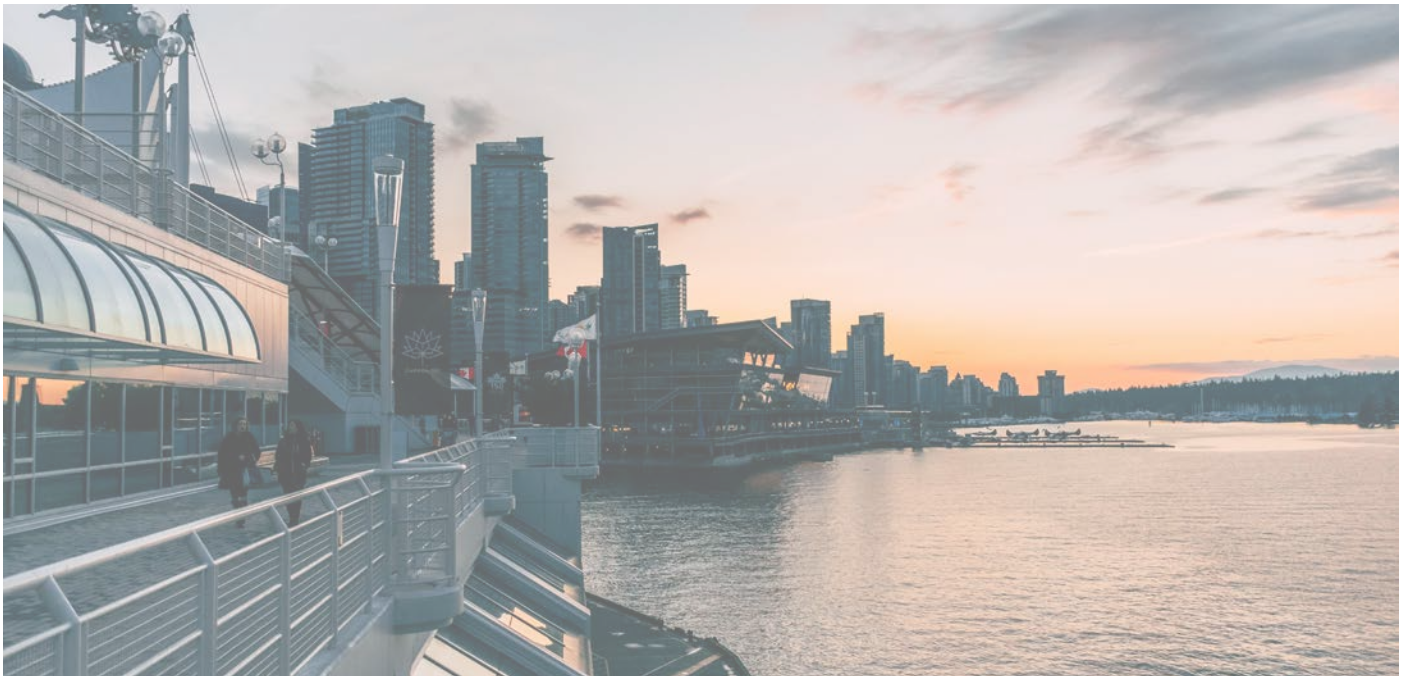


21 VANCOUVER

Joining forces with a twin city

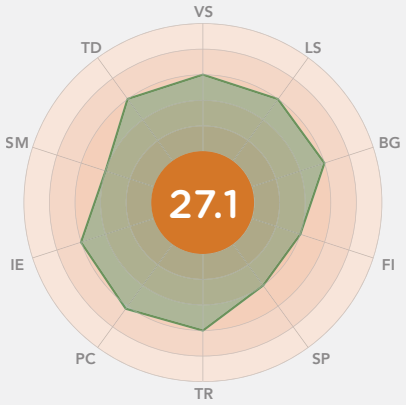
As the two largest cities of Canada's British Columbia province, Vancouver and Surrey collaborated on a common approach to tap on the strengths of both cities in participating in the Smart Cities Challenge organized by Infrastructure Canada.

An online platform, Smarter Together, was launched to generate and collect proposals from citizens, entrepreneurs, start-ups, and enterprises, to ensure that the plan is aligned to the priorities of both cities' citizens. More than 70,000 interactions were received from a series of surveys, social media platforms, sharing sessions at public spaces such as community centres and libraries, and meet-ups with start-ups and tech companies. From there, smart mobility emerged as the main priority of both communities.

The partnership between Vancouver and Surrey shows huge potential in furthering smart city agendas by harnessing their strengths, especially in sustainability. For instance, Vancouver has shown its commitment to sustainability with its renewable city strategy that seeks to obtain 100 percent of its energy from renewable sources before 2050. The City has established a strong foundation in its sustainable technology entrepreneurship ecosystem by developing False Creek Flats, a cluster of emerging innovative green businesses. Surrey implemented a smart waste management system by placing smart bins all around the city, which compress waste periodically to save space and send out alerts when filled. The City also uses solar energy to power its parks and public buildings. This partnership helped the twin cities to get shortlisted for the USD 50 mn award, and their collaboration continues to detail the exact plans for the final round in 2019.

The partnership between Vancouver and Surrey shows huge potential in furthering smart city agendas by harnessing their strengths, especially in sustainability.

SMART CITY GOVERNMENT SCORE



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SP	SUPPORT PROGRAMMES	2.0
TR	TALENT-READINESS	3.0
PC	PEOPLE-CENTRICITY	3.1
IE	INNOVATION ECOSYSTEM	3.0
SM	SMART POLICIES	2.0
TD	TRACK RECORD	3.0

21 WASHINGTON, D.C

Scientific rigour in smart city policies

In Washington DC, the City Administrator's Office of Budget and Performance Management manages Lab@DC that uses scientific research methods to test and improve municipal policies. Lab@DC gathers a team of social scientists, data scientists, operation experts, and policymakers to collectively experiment with new policy ideas, evaluate policy outcomes, and distil insights.

The insights help steer policies in directions that are more aligned with the benefits of the community. For instance, Lab@DC designed a randomized controlled trial (RCT) that randomly assigned public-facing policemen in the city to wear cameras during work, so as to learn about its effects on law enforcement and shape the City's policing protocols.

While one might expect the cameras to change the behaviour of the policemen and civilians by improving transparency and accountability of law enforcement, the research result showed little sign of changes in behaviour. By partnering with scientists to perform scientifically-designed experiments and rigorous data analysis, Washington D.C. is able to pilot policies and make more informed investments on equipment and services that have been proven to be effective.

Currently, Lab@DC lists more than 24 projects on its website for the public to read about the research plans, literature used, and recent updates of any of these projects. In many projects, social scientists conduct dialogues and surveys in a systematic and scientific manner to maximize the engagement with citizens.

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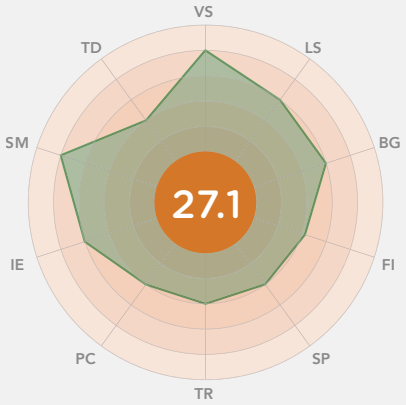
SMART CITY GOVERNMENT SCORE



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SP	SUPPORT PROGRAMMES	2.0
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PC	PEOPLE-CENTRICITY	2.0
IE	INNOVATION ECOSYSTEM	3.0
SM	SMART POLICIES	4.0
TD	TRACK RECORD	2.0

23 NEW DELHI

Creative knowledge exchange to upskill employees

New Delhi Municipal Council (NDMC) had a vision for Delhi "to be the global benchmark for a capital city". The City anchored this vision on providing governance through technology. To deliver on this successfully, digital literacy and upskilling were core goals under its smart city plan.

The following year, NDMC launched India's first "Pradhan Mantri Kaushal Kendra (PMKK) for Skilling in Smart Cities," a centre offering training and certification courses to equip citizens with smart skills. The City is currently developing a smart e-portal that will host a School Management Information System for government schools. NDMC has also been instrumental in launching over 400 smart classrooms and 10 Digital Libraries, that have proven to significantly increase students' grades.

The City is unique from other Indian cities due to its sharp focus on upskilling its employees through global exposure, reflecting its commitment to place users at the centre of its smart city strategy. As early as 2016, the City began hosting workshops to equip officials with basic digital skills such as understanding different modes of e-payment.

A 17-member team of officials from various levels of society – including sewer men, sanitary inspectors, gardeners, accounts officers, and assistant engineers – visited numerous municipal agencies in Beijing to understand their transport, utilities, environment, and emergency operations. Participants observed good practices and processes that could be adopted within NDMC.

Later that year, City representatives visited Belgium to exchange expertise and build co-operation in areas such as Smart City, e-Government, and Urban Renewal. NDMC signed a Twin City Agreement with the City of Leuven, Belgium, establishing its commitment to continuing efforts in hosting student and employee exchange programmes in the coming years.

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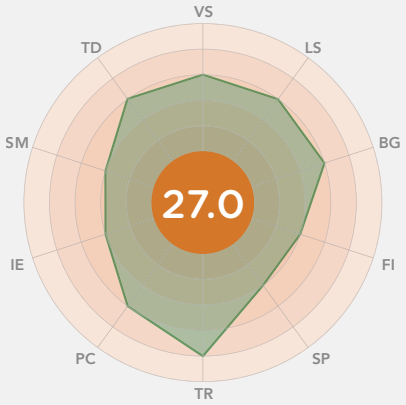
SMART CITY GOVERNMENT SCORE



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PC	PEOPLE-CENTRICITY	3.0
IE	INNOVATION ECOSYSTEM	2.0
SM	SMART POLICIES	2.0
TD	TRACK RECORD	3.0

24 COPENHAGEN

Bicycle-friendly city through intelligent traffic solutions

Copenhagen wants to have the world's best urban environment and offer a unique urban life. As part of this smart city vision, the City has the ambition to become the world's best city for cyclists. Copenhagen is already known for being a bicycle-friendly city. It features 400 km of cycle paths, and about 40 percent of the population commute to work by bicycle. Still, the City Government has set particularly ambitious targets to promote cycling. The City wants at least half of its population to cycle to work, and at least 80 percent of cyclists to feel safe and secure in traffic.

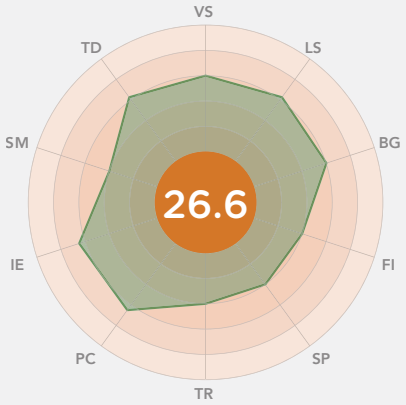
This objective drove Copenhagen's decision to invest in Intelligent Transport Systems (ITS). The Government installed new controllers in traffic signals at 380 intersections throughout the city. ITS help to control traffic and optimize signals in real-time, by prioritizing bike and bus traffic over automobiles. The system also allows city officials to run a variety of simulations based on historical data and mathematical models. They can test different hypothesis around traffic light timings and variable speed limits, to understand how these impact traffic such as during peak hours. This technology is expected to reduce the travel time of cyclists by 10 percent.

In addition, with the collaboration of over 20 municipalities, the City is building a network of 26 bicycle highways covering a total of 300 km, which will increase the number of cycle lanes by 15 percent and improve citizen health to reduce public health expenditure by over USD 46mn annually.

"I don't think that we need some new policies just because we are implementing smart solutions. We can be perceived as a slow organization for not adopting so many new smart policies, but that can sometimes be a good idea. We don't want to implement policies for policies' sake, we wouldn't get anywhere that way."

Christian Gaarde Nielsen
Project Leader
Municipal Development

SMART CITY GOVERNMENT SCORE



VS	VISION	3.0
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SP	SUPPORT PROGRAMMES	2.0
TR	TALENT-READINESS	2.0
PC	PEOPLE-CENTRICITY	3.2
IE	INNOVATION ECOSYSTEM	3.2
SM	SMART POLICIES	2.0
TD	TRACK RECORD	3.1

25 COLUMBUS

From a single concept to a billion dollars

In 2015, the U.S. Department of Transportation launched a Smart City Challenge for American cities to submit proposals for smart transportation systems that improve urban mobility to be funded. The proposal from Columbus, Ohio surpassed 80 other applicants, and secured a USD 40 mn grant for its smart mobility programme.

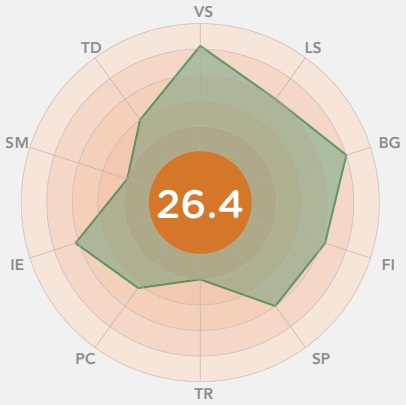
Columbus chose to partner with numerous private sector organizations to fund and implement its large portfolio of projects. For example, the City secured USD 10 mn from tech-focused philanthropic organization, Vulcan Inc., to fund a fleet of electric vehicles and charging infrastructure, among other investments. Columbus also obtained an additional USD 90 mn from local businesses, building partnerships with companies like Alphabet, whose subsidiary Sidewalk Labs seeks to develop safe transportation solutions for expectant mothers, as well as DC Solar, for mobile solar technology.

With this focus on building public-private partnerships, the City convinced many other actors to take part in its smart city journey. Columbus' smart city funds have currently reached USD 500 million, thanks to investments from utility providers, insurance companies, a newly-founded smart city accelerator, the Ohio State University, and the State of Ohio.

With such a high degree of public, private, and academic participation working on smart mobility projects, Columbus is well-positioned to achieve its goal of becoming a carbon-neutral community. Recently, the City has set itself a new goal of reaching USD 1 bn in funding for its smart city projects by 2020.

Columbus chose to partner with numerous private sector organizations to fund and implement its large portfolio of projects. With this focus on building public-private partnerships, the City convinced many other actors to take part in its smart city journey.

SMART CITY GOVERNMENT SCORE



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PC	PEOPLE-CENTRICITY	2.1
IE	INNOVATION ECOSYSTEM	3.1
SM	SMART POLICIES	1.0
TD	TRACK RECORD	2.0

26 LOS ANGELES

Data liaisons to improve inter-agency coordination

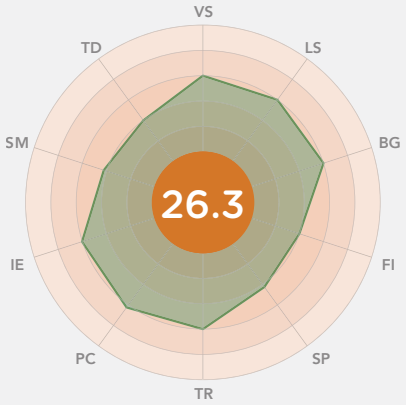
Los Angeles prioritized resilience and sustainability in its "Resilience LA" and the "Sustainable City pLAn". The creation of new roles accompanied the inception of these plans; Mayor Eric Garcetti signed an executive order to appoint Chief Resilience Officers in each of the City's departments, and a new Mayor's Office of Sustainability and Chief Sustainability Officer would oversee the rollout of sustainability initiatives. By instituting these roles and structures, the City openly designated responsibilities for related smart city initiatives.

These two plans and resulting initiatives required new methods of collecting and analysing data. Initially, a working group of data specialists from the City's departments convened for several months to develop GeoHub, the City's first cross-departmental data sharing platform. The City's Chief Data Officer ensured City departments could access and interpret the required data to support decision-making, via a dashboard tailored to the needs of each department. Following another executive order to stimulate open data in Los Angeles, a group of more than 80 appointed data liaisons, called the Citywide Data Collaborative, has been meeting regularly to share good practices for data collection and protection, align efforts, share relevant data sources, and educate themselves and the public through playbooks, how-to guides, and knowledge databases. In this way, the City prevents data collection inefficiencies due to duplication of efforts, standardizes data collection and interpretation quality, and enhances the spirit of collaboration among department representatives.

As LA progressed in its smart city journey, the City relied more heavily on strong coordination among the diverse projects and initiatives. An appointed Smart City Coordinator began to convene a cross-functional working group with members from City departments. Through this mechanism, the departments remain apprised of each other's work.

As LA progressed in its smart city journey, the City relied more heavily on strong coordination among the diverse projects and initiatives.

SMART CITY GOVERNMENT SCORE



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IE	INNOVATION ECOSYSTEM	3.0
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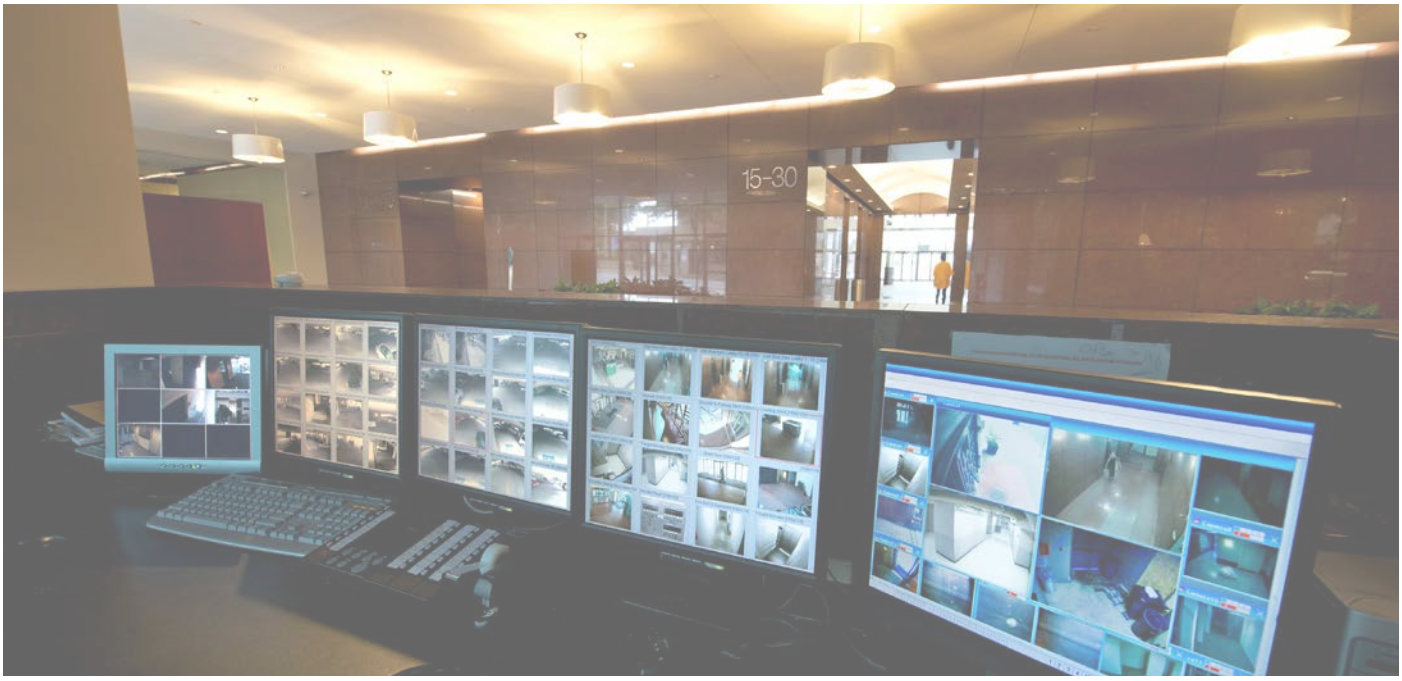
TD	TRACK RECORD	2.0



27 SURAT

Reducing crime with data analytics

The City of Surat began its smart city journey in advance of the Indian Government's Smart Cities Mission, propelled by strategic public-private partnerships.

In 2015, Surat partnered with Microsoft to transform the city's municipal infrastructure and public services, so as to better meet the demands of its growing resident population. The Municipal Commissioner's office launched the Digital City project to find cases where technology could streamline operations and reviewed cross-department functions and services. An online virtual civic centre was built to offer e-services to citizens, and a city dashboard was launched for all administrators to have an integrated and customized view of service delivery metrics.

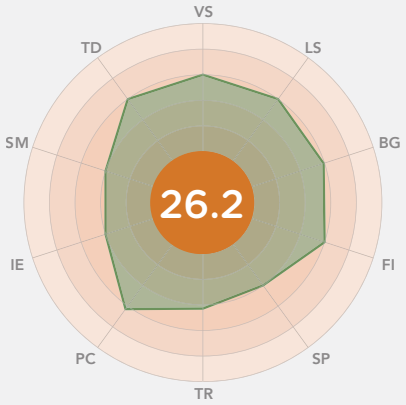
Safety was a key concern for city officials. Due to rapid urbanization, the city had a ratio of only 93 police officers for every 100,000 residents, much lower than the India average of 150. A large "floating population" made it difficult for officials to identify each individual. The Police Commissioner's Office partnered with NEC to set up an integrated command and control centre that can accommodate almost 5,000 cameras, integrate with security grids, and monitor happenings across the city.

The City installed 600 cameras with surveillance technology such as data analytics and advanced facial recognition. The real-time feeds reach the centre, where an algorithm combs through a database of over 30,000 photos of criminals. This led to crime rates reducing by up to 27 percent in parts of the city.

Surat has been able to fast-track its Smart City implementation process due to early strategic preparation and foresight. The City recently won 'The Best City Award' under India's Smart Cities Mission for showing "great momentum in implementing projects."

The real-time feeds reach the centre, where an algorithm combs through a database of over 30,000 photos of criminals.

SMART CITY GOVERNMENT SCORE



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SP	SUPPORT PROGRAMMES	2.0
TR	TALENT-READINESS	2.1
PC	PEOPLE-CENTRICITY	3.1
IE	INNOVATION ECOSYSTEM	2.0
SM	SMART POLICIES	2.0
TD	TRACK RECORD	3.0

28 TOKYO

Systematically introducing smart policies to achieve results

While Tokyo is home to the research and development (R&D) centers of multinational corporations such Honda and IBM, it does not rely solely on private R&D or financial investments in its smart city development but wields smart policies and innovative governing instruments in its smart city drive to become sustainable.

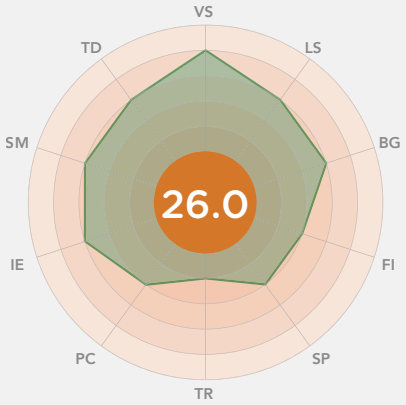
The Tokyo Government's project managers followed a Plan-Do-Check-Act (PDCA) cycle to solidify 500 policy targets, formulated a practical four-year plan for each initiative, and tracked implementation progress. With a systematic work-flow and objective-oriented policies, Tokyo was ranked as the greenest city in Asia Pacific in 2017.

One of the City's policy targets involves promoting the use of LED lights. As a part of the policy, the City partnered with local home appliance stores to offer citizens LED bulbs in exchange for used incandescent bulbs. The government also led by example, installing LED lights in municipal facilities and transforming government buildings to conserve energy.

The Government also drafted the "Tokyo-Style Food Loss Reduction" principles, which resulted in a collaboration with grocery stores and app developers to launch EcoBuy, a mobile app that rebates consumers for purchasing products near expiry. In addition, Tokyo issues green bonds to finance environmental projects, tapping into the rising popularity of responsible investment among investors. The City aims to foster a sense of ownership among Tokyo residents by offering them opportunities to invest directly in sustainability programs.

Tokyo wields smart policies and innovative governing instruments in its smart city drive to become sustainable.

SMART CITY GOVERNMENT SCORE



VS	VISION	4.0
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SP	SUPPORT PROGRAMMES	2.0
TR	TALENT-READINESS	1.0
PC	PEOPLE-CENTRICITY	2.0
IE	INNOVATION ECOSYSTEM	3.0
SM	SMART POLICIES	3.0
TD	TRACK RECORD	3.0

29 BERLIN

Coordinating smart city development in a large city

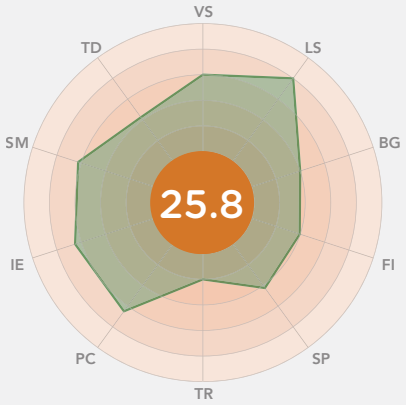
Berlin is the fastest-growing city in Germany. By 2030, it expects to have 250,000 additional inhabitants. This population growth requires the government to have a strong smart city strategy that offers solutions to the accompanying ecological, social, economic, and cultural challenges. For this purpose, the Berlin Senate developed a strategy in 2015 which aims to preserve and enhance the city's appeal and quality of life.

To achieve its objectives, Berlin established a Smart City Network involving over 150 actors from industry, government, city utilities, multinational corporations, financial institutions, consultancies, science and research institutes, start-ups, academic institutions, and innovation centres. This diverse network aims to enhance the integration and synergies of flagship projects and accelerate the implementation of projects with narrow and strategic cooperation among all parties involved. It also provides support at conferences and workshops, offers direct communication with Berlin policymakers, and shares its experience in initiating, developing, and executing smart city initiatives.

Working alongside the network, a Smart City Policy Board is responsible for dictating policy guidelines. The Board sets priorities, develops cooperative partnerships with other urban centres, promotes Berlin as a Smart City, and integrates the Smart City Berlin concept into adjacent policy areas. The City recognizes the importance of involving Berliners to suggest their own ideas, inviting them to take part in project workshops and conducting interviews with action groups.

Berlin understands that designing a smart city only succeeds only when actors from the worlds of politics, science, business, administration, and society work together. This fuels the City's drive to build a distributed and comprehensive governance structure, bringing competencies and resources from all actors into its smart city effort.

SMART CITY GOVERNMENT SCORE



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SP	SUPPORT PROGRAMMES	2.1
TR	TALENT-READINESS	1.0
PC	PEOPLE-CENTRICITY	3.2
IE	INNOVATION ECOSYSTEM	3.2
SM	SMART POLICIES	3.1
TD	TRACK RECORD	2.2

30 BEIJING

Relieving city capacity with a smart district

Ranked among the top ten most congested cities in the world with a population close to that of Australia, Beijing continues to face congestion issues and stress on its public service capacity, despite its six concentric ring roads and a seventh underway.

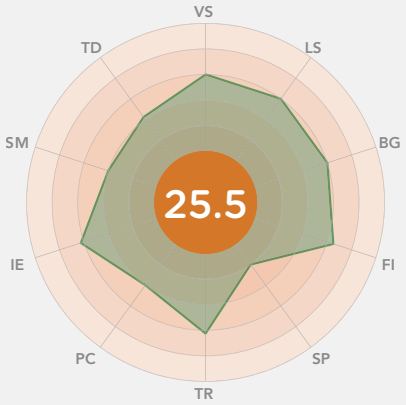
In view of its challenges, Beijing is building a smart district, Tongzhou, in hopes of diverting administrative functions, businesses, and traffic to the larger Beijing megalopolis. The new district would therefore serve as the secondary city center and accommodate municipal administrative functions that would be re-located from the old city center. It is estimated that a population of 400,000 to 500,000 would also move from the primary city center to the secondary city center as a result.

Smart technologies have been playing a central role in the new district since the inception of the district's vision. The underground of central Tongzhou would consist of five layers, including a layer for malls and parking space, a layer for vehicles to reserve the ground for pedestrians and cyclists, a layer for infrastructure equipment, a layer for utility networks and sensors, and a layer for the metro. In the utility network layer, sensors monitor the amount of trash in the trash pipeline and activate a trash collection system that moves trash underground at a speed of 70 km/h.

The data collected by the sensors, together with existing data from government agencies, public agencies, and private corporations in the district would be stored and processed on a central data platform for analysis.

Beijing is building a smart secondary city centre, Tongzhou, which will relieve the capacity stress on the primary city center by diverting some administrative and business functions.

SMART CITY GOVERNMENT SCORE



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PC	PEOPLE-CENTRICITY	2.0
IE	INNOVATION ECOSYSTEM	3.1
SM	SMART POLICIES	2.0
TD	TRACK RECORD	2.1

31 SYDNEY

Skills, infrastructure, and platforms for digital inclusion

Sydney's Digital Strategy champions digital inclusion and offers opportunities "for lifelong learning to ensure that communities, especially vulnerable people, are digitally-skilled, confident, and literate". Another of its priorities is to support businesses to build the skills and knowledge required for the digital age.

To achieve these goals, Sydney has taken steps to fund digital skills programmes. For example, the City's community centres and libraries runs free computer literacy and coding courses. There are also over 180 robotic and education kits within the libraries to inspire children and youths to learn disciplines like science, technology, and engineering.

The City is also developing an experiential learning programme that goes beyond basic digital literacy, using digital tools to develop apps, digital media skills to produce content, and 3D printing and robotics to create new products. The City is also building two new libraries to add to its extensive library network, which would feature a makerspace and an innovation centre that will specifically support creative and technology start-ups.

In addition, the City supports private entities through its Knowledge Exchange grants such as the Spark Festival, a two-week long programme for the tech start-up community with workshops and panel sessions that cover topics like Artificial Intelligence, Blockchain, HealthTech and Virtual Reality, as well as General Assembly, which runs courses and connects small to medium businesses with industry experts in the areas of design, data, technology, and business, and innovation.

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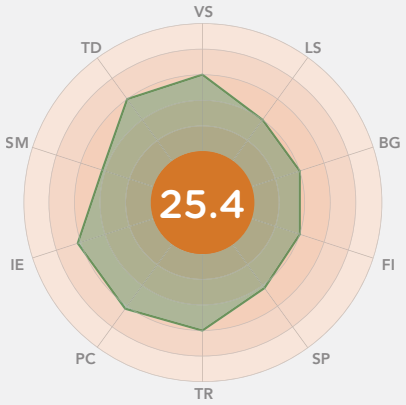
SMART CITY GOVERNMENT SCORE



VS	VISION	3.0
LS	LEADERSHIP	2.0
BG	BUDGET	2.0
FI	FINANCIAL INCENTIVES	2.0
SP	SUPPORT PROGRAMMES	2.1
TR	TALENT-READINESS	3.0
PC	PEOPLE-CENTRICITY	3.1
IE	INNOVATION ECOSYSTEM	3.1
SM	SMART POLICIES	2.1
TD	TRACK RECORD	3.0

32 AHMEDABAD

A State Government-driven smart capital

As the capital city of Gujarat, Ahmedabad has received extensive support from the state government to plan and implement its smart city roadmap. A key strategy employed by the State has been to collaborate with private sector entities to develop a comprehensive Internet-of-Things (IoT) ecosystem in the capital.

The Gujarat Government signed a memorandum of understanding with Google India under the 'Digital Gujarat' initiative. This involves training for entrepreneurs and students to use digital platforms for business, mobile, and web development, offering free cloud facilities worth up to USD 20,000 to selected start-ups.

Inspired by Israel's start-up scene, The International Centre for Entrepreneurship and Technology was launched in the city and has offered mentorship and grooming to 44 start-ups. Cisco has entered into a partnership with the Centre and is building an Internet of Things (IoT) laboratory within the premises. The Centre also intends to partner with incubators and institutions globally to tap on academic and business mentors.

Ahmedabad's strong focus on IoT has led to the successful launch of services such as smart parking, smart lights, smart waste management, and intelligent transportation. To increase safety and coverage of the city, the State Government has also introduced a 30 percent subsidy for residents to install Ahmedabad's residents to install cameras.

IoT-powered devices are helping the City perform root cause analysis, identify correlations for complex decision-making, and improve its overall productivity and response to citizen concerns.

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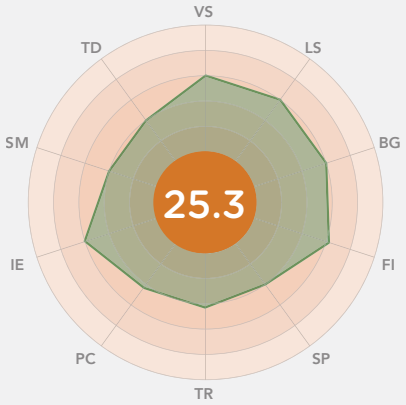
SMART CITY GOVERNMENT SCORE



VS	VISION	3.0
LS	LEADERSHIP	3.0
BG	BUDGET	3.0
FI	FINANCIAL INCENTIVES	3.1
SP	SUPPORT PROGRAMMES	2.0
TR	TALENT-READINESS	2.1
PC	PEOPLE-CENTRICITY	2.1
IE	INNOVATION ECOSYSTEM	3.0
SM	SMART POLICIES	2.0
TD	TRACK RECORD	2.0

32 BHUBANESWAR

Youth-led social interventions

The City of Bhubaneswar has a unique focus on citizen safety and youth involvement. "Socially Smart Bhubaneswar", a strategic pillar of their smart city plan, involves youth so much in discussions, surfacing issues, sharing ideas, and devising smart city interventions, that they take responsibility for implementing initiatives supported by the Bhubaneswar Smart City office. To date, 60 peer leaders have received training to be leaders in community projects; 120 ground-level helpers have received training to support implementation of schemes from the government; and 125 adolescent girls have benefitted from self-defence training. The City has also successfully enabled 25 slums to be declared open-defecation free.

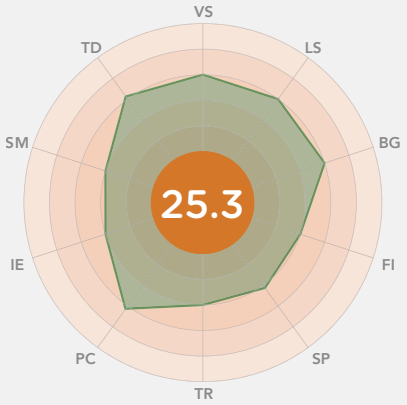
In developing the Smart City plan, the City launched a Citizen Connect initiative to collaboratively develop smart city implementation roadmaps. The City hosted a workshop, "Youth Connect," for National Social Service programme officers, university faculty members, and college teachers to develop systematic action plans for their individual institutes. Some of the activities that have been planned include safety audits of college campuses, workshops for awareness on cybercrimes, and measures to prevent sexual harassment and ragging.

Taking this a step further, the City launched The City Changer Lab, another platform for students to work together on solving social issues. A recent workshop at the lab saw students showcasing solutions such as chilli-powder bangles for safety, as well as vending machines to ease access to sanitary napkins.

The City has signed a memorandum of understanding with United Nations Population Fund (UNFPA), to further initiatives concerning the safety of women, especially in urban slums. Support My City and Neighbourhood Watch are key programmes that are to be launched under this collaboration.

Some of the activities that have been planned include safety audits of college campuses, workshops for awareness on cybercrimes, and measures to prevent sexual harassment and ragging.

SMART CITY GOVERNMENT SCORE



VS	VISION	3.0
LS	LEADERSHIP	3.0
BG	BUDGET	3.0
FI	FINANCIAL INCENTIVES	2.0
SP	SUPPORT PROGRAMMES	2.1
TR	TALENT-READINESS	2.0
PC	PEOPLE-CENTRICITY	3.1
IE	INNOVATION ECOSYSTEM	2.0
SM	SMART POLICIES	2.0
TD	TRACK RECORD	3.1

34 JAIPUR

Involving citizens in developing smart heritage

When Jaipur started its smart city journey in 2016, it emphasized the importance of a smart city vision that reflects citizen aspirations. The Government of Rajasthan relied on citizen engagement and insights to design its smart city proposal and identify preferred areas for development and issues to prioritize. The Government conducted a two-round consultation campaign that reached 1.6 mn residents and yielded close to 150,000 suggestions. Citizens voted to develop the heritage zone and walled city area, and to prioritize heritage, tourism, transportation, and mobility in its smart city vision.

These citizen preferences guided Jaipur's smart city objective to have world-class smart heritage, by preserving and improving old heritage buildings, along with smart and sustainable infrastructures solutions to enhance the tourist experience. In addition, Jaipur aspires to raise its average length of stay of tourists from 2.8 days to 3.5 days by 2025, and pedestrian mobility from 15 percent to 25 percent, with 100 percent free access in pedestrian areas by 2019.

These goals helped the City prioritize clear actions in building their smart city. The Government chose to make façade improvements of heritage walks, build a heritage app for monument information, train tourist guides and the tourism police, offer public bike sharing, and introduce smart signage for traffic. Thanks to its citizen-centric approach, Jaipur blends modernity with heritage for the benefit of the 40 mn visitors that come each year to enjoy the city's wonders.

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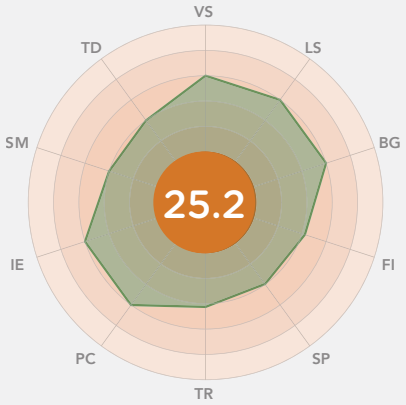
SMART CITY GOVERNMENT SCORE



VS	VISION	3.0
LS	LEADERSHIP	3.0
BG	BUDGET	3.0
FI	FINANCIAL INCENTIVES	2.1
SP	SUPPORT PROGRAMMES	2.0
TR	TALENT-READINESS	2.1
PC	PEOPLE-CENTRICITY	3.0
IE	INNOVATION ECOSYSTEM	3.0
SM	SMART POLICIES	2.0
TD	TRACK RECORD	2.0

35 ATLANTA

Becoming systematic when scaling

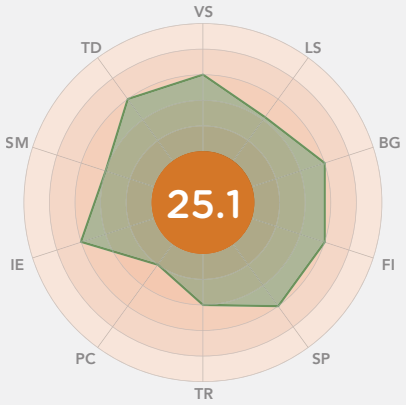
SmartATL, the City of Atlanta's smart city roadmap, outlined the key pillars of its rollout, including mobility, public safety, environmental sustainability, city operational efficiency, as well as public and business engagement. Along the way, the City designated its North Avenue Smart Corridor as a smart district to pilot smart city technologies such as IoT sensors for data collection, video surveillance to assist with traffic management, interactive LED street lights, and autonomous vehicles.

As these and other projects accumulated, the City recognized the need to become more systematic in rolling out smart city projects beyond its smart district and across the city. The City's Department of Public Works issued an RFP as part of the Atlanta Smart City Strategic Infrastructure Initiative. Through the RFP, the City hopes to design, plan, and roll out smart city initiatives with greater organization and coordination. In effect, the City gave businesses and partners the opportunity to further detail the roadmap with well-scoped and related initiatives.

The City continues to engage in collaborations and partnerships beyond businesses and implementers. A delegation from Atlanta attended the 2017 Smart City Expo World Congress to bring smart city best practices back to their city. The Smart Cities Collaborative invited Atlanta to work with 22 other cities and suburbs on mobility challenges they face.

Through the RFP, the City hopes to design, plan, and roll out smart city initiatives with greater organization and coordination. In effect, the City gave businesses and partners the opportunity to further detail the roadmap with well-scoped and related initiatives.

SMART CITY GOVERNMENT SCORE



VS	VISION	3.0
LS	LEADERSHIP	2.1
BG	BUDGET	3.0
FI	FINANCIAL INCENTIVES	3.0
SP	SUPPORT PROGRAMMES	3.0
TR	TALENT-READINESS	2.0
PC	PEOPLE-CENTRICITY	1.0
IE	INNOVATION ECOSYSTEM	3.0
SM	SMART POLICIES	2.0
TD	TRACK RECORD	3.0

36 PUNE

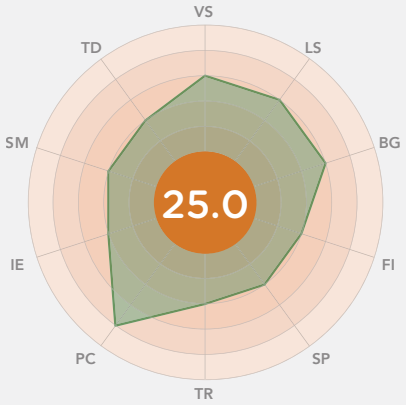
Pledging to hold a city accountable

The City of Pune defines "smart city" as a city that puts citizens first. In achieving its Smart City vision to "become the most liveable city in India by solving its core infrastructure issues in a future-proof way," the City aims to make governance citizen-friendly and cost-effective. As part of this approach, Pune uses online channels to deliver services and ensure accountability and transparency, thereby reducing citizen visits to offices.

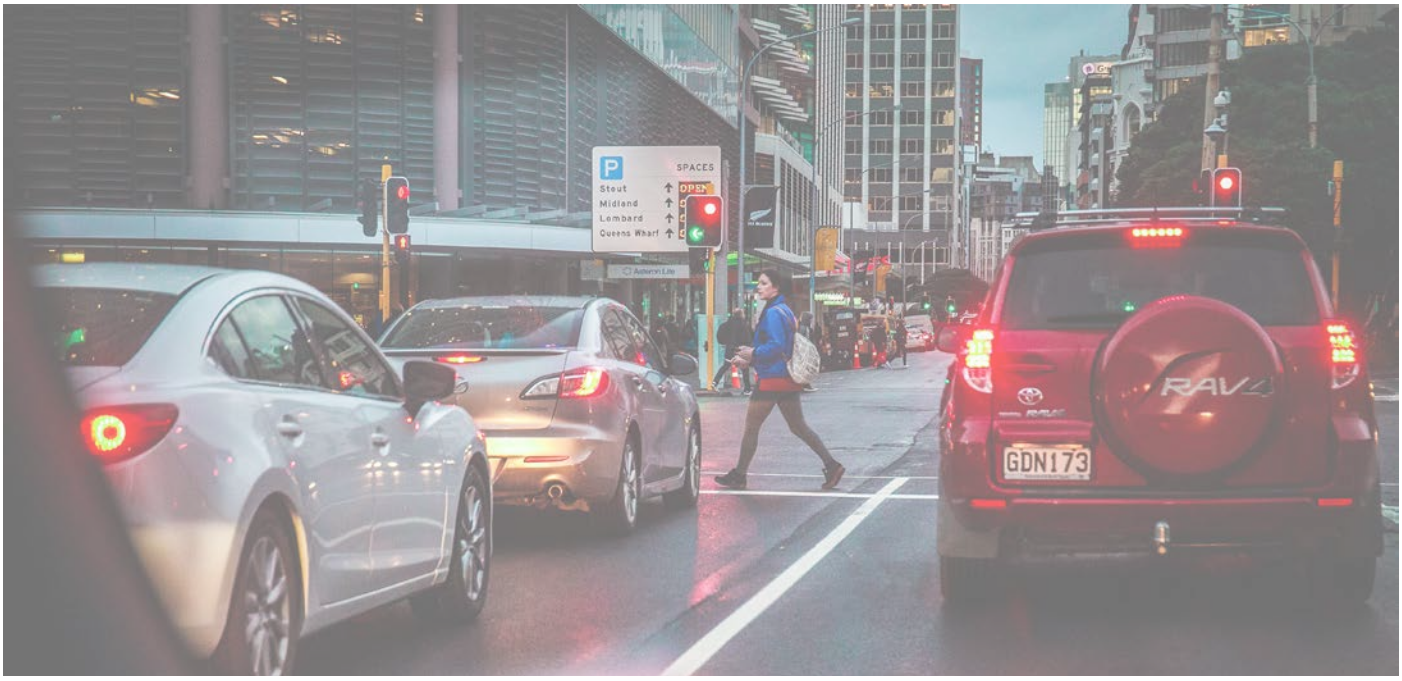
At the heart of the City's plan is its 5S citizen engagement approach: Speed; Scale; Structure; Solutioning; and Social Audit. The goals of the approach included ensuring the entire process was wrapped up in a 100-day timeframe, and reaching out to citizens across socio-economic segments. In the final Social Audit phase, after incorporating citizen feedback on the plans and insights, the City urged citizens to take the "Smart City Pledge." This ensured citizens were fully-aware of the plan, developments that would happen in the future, the impact of initiatives, and implementation requirements. As of 2015, 700,000 households from Pune had committed to follow up and track the City's progress on smart city initiatives for the next ten years.

The City of Pune has found innovative ways to remain accountable to its citizens while also ensuring they are empowered to hold it responsible. The City set up a comprehensive 24/7 "war room" to monitor and track smart city activities, including social media developments. The room has been organized into cells for analytics, creative management, response management, documentation management, campaign and activity management teams. Citizens can also experience a gallery walk in the war room, to gain a thorough understanding of the workings of the smart city office and the progress of various plans.

SMART CITY GOVERNMENT SCORE



VS	VISION	3.0
LS	LEADERSHIP	3.0
BG	BUDGET	3.0
FI	FINANCIAL INCENTIVES	2.0
SP	SUPPORT PROGRAMMES	2.0
TR	TALENT-READINESS	2.0
PC	PEOPLE-CENTRICITY	4.0
IE	INNOVATION ECOSYSTEM	2.0
SM	SMART POLICIES	2.0
TD	TRACK RECORD	2.0



37 WELLINGTON

Co-designing solutions to become a safe city

The City of Wellington's plan "Towards 2040: Smart Capital" has four key goals, one of which is to become a people-centred city. One of the City's key initiatives therefore centres around the theme of safety, to ensure timely and accurate response for its people during times of need.

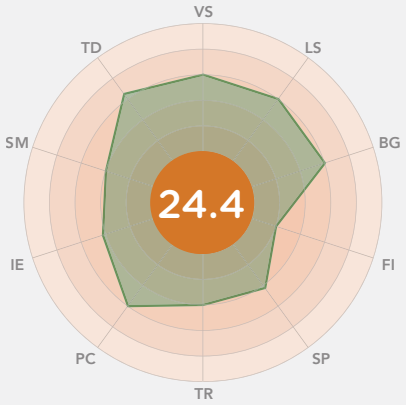
Over a hundred stakeholders from public agencies – such as the New Zealand Police, New Zealand Fire Service, and Regional Public Health, social service providers, residents, vulnerable groups, and retailers – were engaged in a safe city workshop to co-create and develop solutions that could improve public safety. This was part of the Safe City Living Lab, a partnership between Wellington and Japanese tech provider NEC.

This collaborative approach extended into the way data was integrated and shared on the Living Lab's data platform "Smart Board", which includes current internal datasets of the City, partnering agencies, and external databases such as the national graffiti database. This was further combined with data collected by its sensor network, and built into a map to generate insights reflecting street-level trends. Insights are presented in heat maps and clusters of different scales for different agencies to analyse and have a more informed response to the incidences affecting the city. For instance, visual sensors were deployed to count begging occurrences and alert the relevant agency to respond and connect these individuals of need with the appropriate and relevant support services.

"Smart cities are all about the relationship between people and the government. It's the government's role to use the smart city to build trust in order to govern more effectively. Most importantly, smart cities are something you have to do together, if you want to achieve better living standards"

Sean Audain
Innovation Officer (Smart City)
Wellington City Council

SMART CITY GOVERNMENT SCORE



VS	VISION	3.0
LS	LEADERSHIP	3.0
BG	BUDGET	3.0
FI	FINANCIAL INCENTIVES	1.0
SP	SUPPORT PROGRAMMES	2.1
TR	TALENT-READINESS	2.0
PC	PEOPLE-CENTRICITY	3.0
IE	INNOVATION ECOSYSTEM	2.1
SM	SMART POLICIES	2.0
TD	TRACK RECORD	3.2

38 KANSAS CITY

Building the "54 Smartest Blocks in The Nation" on a budget

The Chief Innovation Officer of Kansas City, Bob Bennett, shares his definition of smart city as a concept that "has nothing to do with technology… but is about creating a holistic picture of what the citizens have." Starting with a citizen-centric governing philosophy, Kansas City has formed extensive partnerships with smart solution providers and consultancies to build the "54 smartest blocks in the nation".

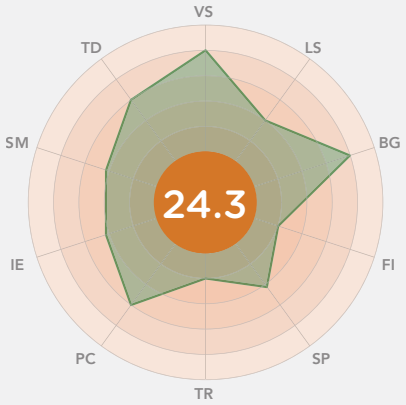
After Kansas City started the construction of its downtown streetcar, Cisco and Think Big approached the City to form a public-private partnership, which eventually expanded to include other smart solution providers such as Sprint and Sensity, to roll out a smart city roadmap for Kansas City. To implement this, the City budgeted only USD 3.8 mn, while the rest of the USD 20 mn investment coming from partners.

The project materialized in May 2016 as a corridor along the two-mile-long track of Kansas City's streetcar which carries more than 5,000 passengers for free every day. The corridor is covered with free public Wi-Fi and sensors that track traffic and pedestrian flow. The City visualizes and publishes the data so that anyone is able to view the traffic volume online in real-time. The streetlights also adjust their brightness to conserve electricity. Other information, like the phone numbers of public Wi-Fi users, provides business insights into the demographics of people present in the area, which can inform businesses about how to orient their marketing strategies.

"The concept of smart city has nothing to do with technology... but is about creating a holistic picture of what the citizens have."

Bob Bennett
Chief Innovation Officer
Kansas City

SMART CITY GOVERNMENT SCORE



VS	VISION	4.0
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BG	BUDGET	4.0
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SP	SUPPORT PROGRAMMES	2.1
TR	TALENT-READINESS	1.0
PC	PEOPLE-CENTRICITY	3.0
IE	INNOVATION ECOSYSTEM	2.1
SM	SMART POLICIES	2.1
TD	TRACK RECORD	3.0

39 TORONTO

Funding smart city projects with public-private partnerships

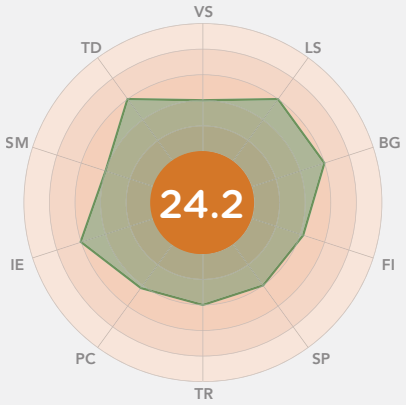
The City of Toronto established a Smart Cities Working Group in 2016, involving both public and private stakeholders including the City Government, academia, and private enterprises, to strengthen a smart ecosystem and facilitate partnerships. Active collaboration has helped the City secure new sources of funding for its various smart city initiatives.

The Civic Innovation Office is a partnership between the City of Toronto and the Bloomberg Foundation, that aims to develop and co-create innovative urban solutions with private partners. It was the result of one of the Foundation's awards which funds innovation teams that help City leaders drive innovation, change culture, and guide problem-solving when delivering public services. The Foundation fully funds the USD 500,000 office budget for the first three years. Aside from the funding, the Foundation provides implementation support and best practices from other cities to the City.

The City of Toronto issued a public tender for the revitalization of its Quayside area, to create a smart city demonstration area for clean technology, urban transportation, building, and construction technologies. The City works with Alphabet's Sidewalk Labs as its innovation and funding partner to jointly execute the project, with the company committing USD 50 mn for its initial pilot test-bedding phase.

The City of Toronto is revitalizing its Quayside area, to create a smart city demonstration area for clean technology, urban transportation, building, and construction technologies.

SMART CITY GOVERNMENT SCORE



VS	VISION	2.0
LS	LEADERSHIP	3.0
BG	BUDGET	3.0
FI	FINANCIAL INCENTIVES	2.1
SP	SUPPORT PROGRAMMES	2.0
TR	TALENT-READINESS	2.0
PC	PEOPLE-CENTRICITY	2.1
IE	INNOVATION ECOSYSTEM	3.0
SM	SMART POLICIES	2.0
TD	TRACK RECORD	3.0

40 DUBAI

Investing in the green economy

The City of Dubai has designed its smart city strategy around a theme of sustainability, to support its long-term vision of preparing for the future and accounting for the needs of future generations.

The City Government successfully launched a paperless initiative since February 2018. This green initiative was launched in multiple phases, and is predicted to save the government over one billion sheets of paper annually. The City is also working on making this transition seamless for citizens, by progressively deploying the initiative over the next three years across all government departments. To ensure successful implementation, the City is encouraging the use of automation and making legislative changes to pass policies that support automation.

Dubai is also heavily investing in green technologies. The City approved an investment of USD 7.2 bn for power and sustainable energy initiatives for 2018. "The Sustainable City" is another government-funded green initiative designed to be emission-free, car-free, and powered by solar panels. The City has invested USD 354 mn so far in this initiative, which is expected to be completed in 2019. Dubai is also projected to turn 25 percent of its transportation into autonomous transportation. This driverless transportation initiative is predicted to save commuters hundreds of millions of hours annually, while reducing carbon emissions and transportation costs.

These commitments reflect Dubai's commitment to becoming a model for the green economy.

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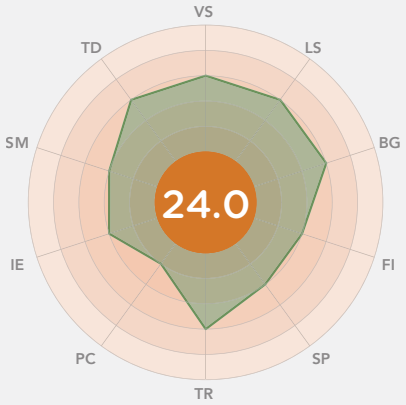
SMART CITY GOVERNMENT SCORE



VS	VISION	3.0
LS	LEADERSHIP	3.0
BG	BUDGET	3.0
FI	FINANCIAL INCENTIVES	2.0
SP	SUPPORT PROGRAMMES	2.0
TR	TALENT-READINESS	3.0
PC	PEOPLE-CENTRICITY	1.0
IE	INNOVATION ECOSYSTEM	2.0
SM	SMART POLICIES	2.0
TD	TRACK RECORD	3.0

41 DUBLIN

Embracing humility in smart city design

The City of Dublin has adopted a humble approach towards smart city development. The City acknowledged its own limitations in terms of size and expertise and chose instead to consult experts, businesses, and citizens in designing its smart city solutions.

Dublin began its smart city journey with a strong belief that a smart city should be discreet, functioning in the background of its citizens' daily lives. Michael Guerin, project manager at Smart Dublin affirms this, "We had no need for a big fancy approach". The City chose to keep its pilot smart initiatives at a small scale until it was certain of their efficacy, thereby avoiding unnecessary costs.

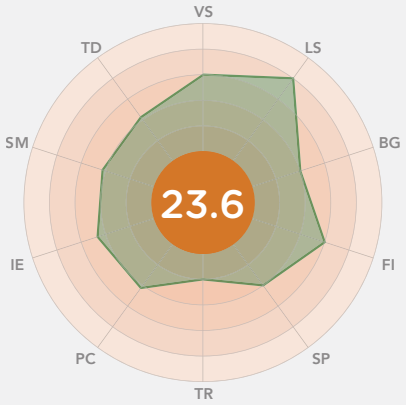
The City also appointed a panel of experts its "Smart City Advisory Network," to advise the City on its Smart Programs and ensure they align with its smart vision. The panel comprised of private sector organizations such as IBM and Cisco, public sector organizations, communication experts, research centres, innovation hubs, and community representatives. This initiative aims to engage all parties in the conversation about applying new technologies across Dublin, and to provide an independent expert leadership to guide decisions around these applications.

By taking time to listen to experts and test each initiative before scaling it up, Dublin has successfully kickstarted 17 smart projects around the city. The City also aims to involve multiple agents in designing smart solutions and is allocating over USD 1 mn in grants for 2018 for organizations and individuals deploying technologies in areas such as internet of things (IoT) and social inclusion.

"The idea of a smart city is not to cover the place in technology that is not necessarily useful and deploy technology just for the sake of it. The idea is to make the smart city much easier to live in, and to make it work more efficiently."

Michael Guerin
Project Manager
Smart Dublin

SMART CITY GOVERNMENT SCORE



VS	VISION	3.0
LS	LEADERSHIP	4.0
BG	BUDGET	2.0
FI	FINANCIAL INCENTIVES	3.0
SP	SUPPORT PROGRAMMES	2.0
TR	TALENT-READINESS	1.0
PC	PEOPLE-CENTRICITY	2.1
IE	INNOVATION ECOSYSTEM	2.3
SM	SMART POLICIES	2.1
TD	TRACK RECORD	2.1

42 TEL AVIV

Entrepreneurship and the smart city

Tel Aviv's vibrant start-up ecosystem has helped catalyse its smart city journey. The city is reported to have the highest start-up density in the world and its rising businesses are growing at 40 percent year-on-year. Its Silicon Wadi area – with its 1,500 start-ups and over a hundred co-working spaces and research facilities – is attracting top global talent and investments from multinationals.

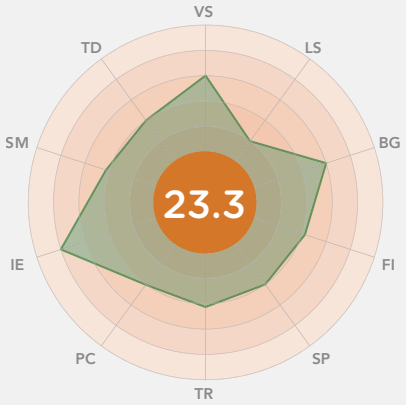
The Israeli Government has been catalysing the development of this ecosystem since 1993 with initiatives like a venture capital fund Yozma, offering tax incentives to foreign VCs and committing to match their investments. The large numbers of conscripts passing through the cyber and intelligence division of Israel's military and collaborations between the military and the tech start-up also prepared more Israelis to work with digital technologies.

The growing entrepreneurial pool in Tel Aviv and high digital literacy in Israel jointly contributed to the development of five smart sectors in the city: Cybersecurity with cyberthreats solutions like CheckPoints and CyberArk; Transport and navigation with driverless car system Mobileye and Navigation app Waze; Aviation and drone firms such as Flytrex and Airobotics; Water and agricultural technology such smart irrigation system SupPlant; as well as Artificial intelligence and robotics as illustrated by emotionally-intelligent robotic companion ElliQ.

As a result of this thriving ecosystem, several Tel Aviv-based startups developing smart solutions have achieved global renown. In 2014, public engagement app DigiTel won Tel Aviv the title of Smart City of the Year at the Smart City Expo. The municipality of Tel-Aviv Yafo took note of this achievement and has since then developed its own formal smart city strategy. Today, Tel-Aviv aspires to continue leveraging technology in engaging its citizens and businesses and providing them with a higher quality of life and better efficiency.

The city is reported to have the highest start-up density in the world and its rising businesses are growing at 40 percent year-on-year

SMART CITY GOVERNMENT SCORE



VS	VISION	3.0
LS	LEADERSHIP	1.0
BG	BUDGET	3.0
FI	FINANCIAL INCENTIVES	2.1
SP	SUPPORT PROGRAMMES	2.0
TR	TALENT-READINESS	2.1
PC	PEOPLE-CENTRICITY	2.0
IE	INNOVATION ECOSYSTEM	4.0
SM	SMART POLICIES	2.1
TD	TRACK RECORD	2.0

43 PHILADELPHIA

Never too late to re-engage residents

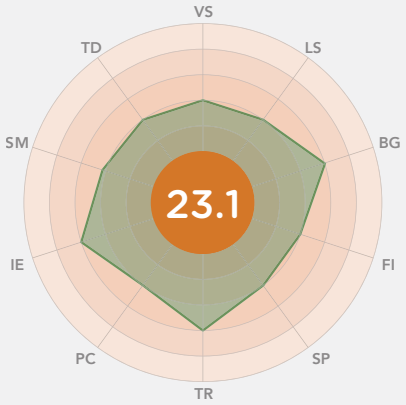
By the time the City of Philadelphia systematically embarked on its smart city journey, many smart city initiatives and projects were already unfolding. The City Planning Commission had drafted an overarching masterplan, Philadelphia 2035, to initiate projects that increase the overall sustainability of the city. Like many other U.S. cities, Philadelphia adopted a data-driven Vision Zero plan to eliminate traffic fatalities. The City's Water Department and Office of Sustainability implemented smart utilities projects. The private sector also initiated smart city projects such as secure network infrastructure for IoT.

The City recognized that residents had been left out of the decision-making process, and sought to engage residents to co-define what a smart city meant to them. The City invited residents from all social strata to take part in a workshop that sourced their key concerns and aspirations for their neighbourhoods, and experts helped clarify ongoing city efforts to address other city-wide issues.

Several City initiatives followed from the workshop, including a focused effort on increasing digital inclusion, an initiative pairing younger staff with older staff in city departments to mix fresh thinking with seasoned experience, and the recruitment of tech-savvy staff to prepare for smart city projects. The City initiated a request for proposals to create a detailed smart city strategic roadmap aligned to the broader Philadelphia 2035 vision, enabled in part by a USD 200,000 injection by a national foundation.

The City recognized that residents had been left out of the decision-making process, and sought to engage residents to co-define what a smart city meant to them.

SMART CITY GOVERNMENT SCORE



VS	VISION	2.0
LS	LEADERSHIP	2.0
BG	BUDGET	3.0
FI	FINANCIAL INCENTIVES	2.0
SP	SUPPORT PROGRAMMES	2.0
TR	TALENT-READINESS	3.0
PC	PEOPLE-CENTRICITY	2.0
IE	INNOVATION ECOSYSTEM	3.0
SM	SMART POLICIES	2.1
TD	TRACK RECORD	2.0

44 REYKJAVIK

Letting citizens determine smart city funding allocations

Reykjavik, Iceland's capital, has a open and smart city focus on smart mobility, infrastructure, and technologies. Among its projects, "My Neighborhood", particularly stands out as an annual participatory democracy budgeting portal. This is the joint effort of a non-profit organization, which provides the software, the City of Reykjavik, which runs the election, and the National Registry, which authenticates voters.

Started in 2011, the initiative enables city residents to present and vote on ideas to improve Reykjavik's neighbourhoods, such as security cameras on specific roads, hiking and cycling bridges, and new roundabouts. Each year, citizens decide on the allocation of over USD 4 mn to implement such ideas crowdsourced from their peers.

Any resident can submit an idea on the platform which the Government first evaluates in terms of costs and feasibility. Citizens as young as 16 years old can then vote on validated ideas through an electronic, secure, and binding vote. The interactive platform allows voters to allocate a set budget across several projects, and discard projects that exceed the budget. Since the portal's inception, over 600 ideas were approved, giving thousands of residents real influence in shaping their environment.

For the first time in Iceland's history, the City chose in 2017 to crowdsource ideas for its education policy from citizens. The process is still ongoing, with the first phase of prioritizing educational objectives recently finished.

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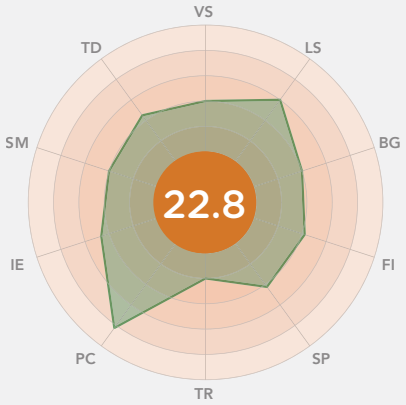
SMART CITY GOVERNMENT SCORE



VS	VISION	2.0
LS	LEADERSHIP	3.0
BG	BUDGET	2.0
FI	FINANCIAL INCENTIVES	2.1
SP	SUPPORT PROGRAMMES	2.1
TR	TALENT-READINESS	1.0
PC	PEOPLE-CENTRICITY	4.1
IE	INNOVATION ECOSYSTEM	2.3
SM	SMART POLICIES	2.0
TD	TRACK RECORD	2.2

45 LYON

Running smart city experiments

Lyon is the third-largest city and second-largest urban area of France. It is constantly experimenting with behavioural approaches to reduce citizen reluctance to change and adapt of new technologies.

The City encourages individuals and businesses to experiment and become familiar with smart city solutions through a culture of "doing together". Tuba, for example, is a living lab project that invites all inhabitants of the city – citizens, start-ups and large businesses – to learn about ongoing piloted smart initiatives and participate in the experimentation process. This lab has an open invitation to all stakeholders to introduce them to the benefits of smart solutions and encourage them to embrace change. The City dedicates a budget to support smart solution experimentation. By testing their own ideas and enjoying the process, these stakeholders become less resistant to the City's overarching transformation plan.

Besides technology trials, the City also sends the message that adopting smart technologies will not compromise established routines. The municipality crafted its smart city pitch as 'technology in the service of the Lyonese lifestyle', to reduce resistance to change. Another strategic approach of the City has been to emphasize the ability of technology to foster city pride. Smart solutions gain popularity among citizens if they promote a unique Lyonese lifestyle.

Lyon's behavioural approach to easing stakeholders into a smarter city is proving to be effective. The City has more than 100 citizens participating in ongoing experimentation projects and 289 partnerships for developing smart projects.

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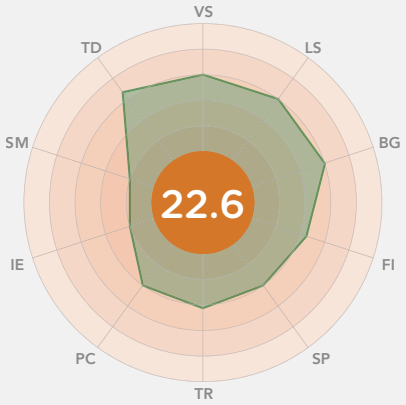

VS	VISION	3.0
LS	LEADERSHIP	3.0
BG	BUDGET	3.0
FI	FINANCIAL INCENTIVES	2.2
SP	SUPPORT PROGRAMMES	2.0
TR	TALENT-READINESS	2.1
PC	PEOPLE-CENTRICITY	2.0
IE	INNOVATION ECOSYSTEM	1.0
SM	SMART POLICIES	1.0
TD	TRACK RECORD	3.3

46 PARIS

Beauty and the smart city

Paris' smart transformation, building on its historical strengths in aesthetics and originality, is envisioned to marry resilience and beauty. The municipality aims to re-invent the city with a strong emphasis on sustainable design and a circular economy.

For this purpose, Paris' City Hall launched the "2050 Paris Smart City" project, to crowdsource sustainable future designs of the to-be smart city. As part of the Climate Energy Plan of Paris, the City eventually commissioned local architecture firm Vincent Callebaut for its designs that proposed to transform Paris into a futuristic smart city. The firm's design involved eight multi-use structures ranging from "honey-comb" towers that harvest sunlight and produce biofuels, to "farmscrapers" towers that filter air and host agriculture fields for local food production. The sustainable features further included the use of photovoltaic and thermal shields in residential towers, and reversible hydro-electrical pumps to generate clean energy from collected rainwater.

These designs aimed to achieve environmental sustainability, and to meet Paris' projected population growth needs. They address housing and density issues by optimizing the use of space. The City is still in the early stages of its smart journey, and it might be a while till the vision is realised. Nonetheless, Paris' aspirations for a beautiful sustainable city stand out as an expression of the city's renowned creativity and attention to detail.

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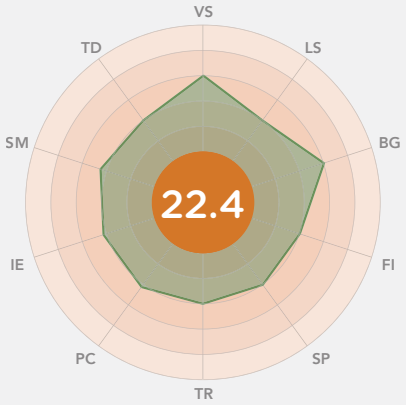
SMART CITY GOVERNMENT SCORE



VS	VISION	3.0
LS	LEADERSHIP	2.0
BG	BUDGET	3.0
FI	FINANCIAL INCENTIVES	2.0
SP	SUPPORT PROGRAMMES	2.0
TR	TALENT-READINESS	2.0
PC	PEOPLE-CENTRICITY	2.1
IE	INNOVATION ECOSYSTEM	2.1
SM	SMART POLICIES	2.2
TD	TRACK RECORD	2.0

47 JAKARTA

Analysing crowdsourced data to serve citizens

One of Jakarta's Smart City objectives seeks to improve the responsiveness of its public services by analysing Big Data from citizen feedback. To do so, the City has taken on a phased approach: From establishing data policy, to collecting data, analysing and creating insights, and collaborating with private enterprises.

In 2012, Indonesia embarked on its Open Government Indonesia initiative to start its open government reforms. Jakarta became the first city in the country to enact its own by-law on data and system management, encouraging public agencies in the city to share their public data. In 2014, the Jakarta Smart City programme was set up as a data platform to integrate various data crowdsourced from citizens, such as Waze which provided real-time information on traffic conditions, a Twitter account sharing real-time information on flood conditions, and Qlue, an app for citizens to report complaints.

With data collected and integrated onto a central platform, the next phase involved generating insights to inform policymaking. The Jakarta Smart City unit now has a dedicated data scientist, and the City has also been taking steps to train officials to advance their analytics capabilities and address the skill gaps in its current administration.

Jakarta aspires to become a "City 4.0", where the City becomes a one-stop platform that enables industry collaborations to take place between private enterprises and its public agencies, in sharing data, developing insights, and further improving its public services to better meet its citizen needs.

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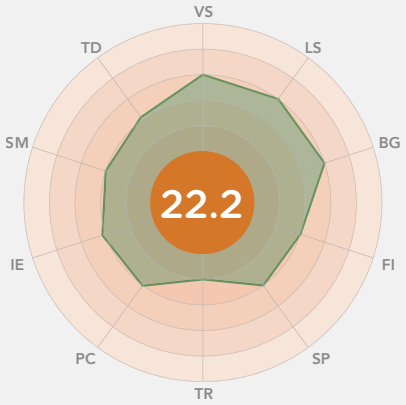
SMART CITY GOVERNMENT SCORE



VS	VISION	3.0
LS	LEADERSHIP	3.0
BG	BUDGET	3.0
FI	FINANCIAL INCENTIVES	2.0
SP	SUPPORT PROGRAMMES	2.0
TR	TALENT-READINESS	1.0
PC	PEOPLE-CENTRICITY	2.0
IE	INNOVATION ECOSYSTEM	2.1
SM	SMART POLICIES	2.0
TD	TRACK RECORD	2.1

48 RIO DE JANERIO

Building a resilient smart city

Natural disasters have been a longstanding challenge for Rio de Janeiro. Considerable construction work along the slopes and the hills, coupled with heavy rainfall over a short period of time, has contributed to this. In 2010 alone, landslides killed 200 people, moved 11,000 people from their homes, and threatened to destroy close to 10,000 houses.

The City realized the need to curtail these losses, and began its journey to develop a resilient city that could protect its citizens. In response, it opened its Centre of Operations in 2010, a data warehouse to store data on traffic, security, weather, and energy. Through this data exchange, the response time to traffic accidents decreased by 25 percent. The centre also houses a dedicated press room, where officials aggregate real-time information about city happenings and publish it on social media.

The City went on to establish the Centro Integrado de Comando e Controle Regional (Integrated Centre of Command and Control to facilitate data flows between city, emergency, and military services when coordinating and dispatching essential services. The City has also engaged residents to create greater community integration. One such project, coordinated by UNICEF in collaboration with a local non-government organization, involves working with local teenagers to digitally map five favelas , to highlight their living challenges and widen the coverage of city areas monitored.

Further, the City has a Citizen Service Centre 1746 with a service capacity to be able to handle up to 600,000 calls a month. A community alert and alarm system as part of the Community Protection Program, also has been put in place to complement this, empowering citizens with early information and warnings.

By harnessing the power of smart solutions and involving their citizens in creative ways, Rio has built its resilience as a smart city.

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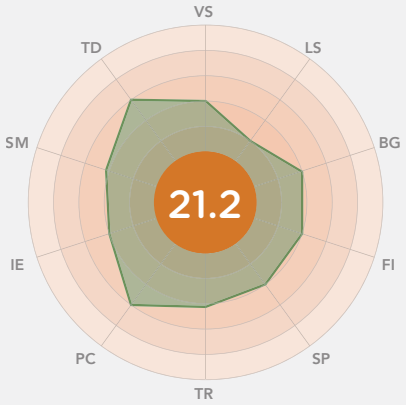
SMART CITY GOVERNMENT SCORE



VS	VISION	2.0
LS	LEADERSHIP	1.0
BG	BUDGET	2.0
FI	FINANCIAL INCENTIVES	2.0
SP	SUPPORT PROGRAMMES	2.0
TR	TALENT-READINESS	2.1
PC	PEOPLE-CENTRICITY	3.0
IE	INNOVATION ECOSYSTEM	2.0
SM	SMART POLICIES	2.1
TD	TRACK RECORD	3.0

49 PHUKET

Using technology to enhance its booming tourism sector

Phuket's smart city vision focuses on promoting its creative economy and developing sustainable growth on the tourism island, to "bring happiness" to both locals and tourists.

In an effort to make the city a safe environment for tourists, Phuket uses Internet-of-Things (IoT), mobile services, and data analytics to inform tourists and the local police about the happenings in the city. Phuket has about 2,000 surveillance cameras operated by both public and private agencies, that cover most public spaces including shorelines and street checkpoints. The cameras will automatically tag and recognize the facial features of tourists. Individuals entering Phuket by street will have their faces captured and matched against a police database. The surveillance network is currently being integrated and centralized with its big data analytics platform, to enable the police to receive timely alerts in emergency situations.

The Phuket Province also plans to integrate its tourist database with the yacht service database to track tourists even when they travel out to the sea. In addition, the Government launched mobile applications such as Smart Phuket and Police "i lert u", where citizens can alert the police to emergencies and seek timely help.

Another pillar of the use of technologies in Phuket is to generate more tourism business opportunities. The City provides more than 1,000 free Wi-Fi hotspots for tourists, which helps to collect their demographic data. An operations centre integrates all data collected by these hotspots to generate useful consumer insights that enable local businesses to formulate more targeted marketing strategies.

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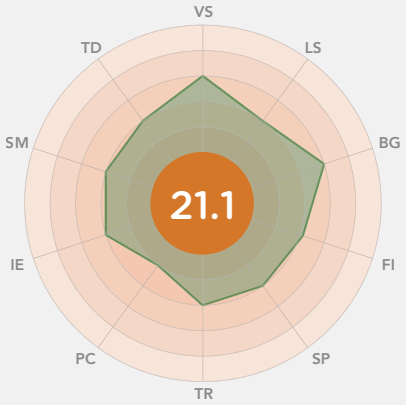

VS	VISION	3.0
LS	LEADERSHIP	2.0
BG	BUDGET	3.0
FI	FINANCIAL INCENTIVES	2.1
SP	SUPPORT PROGRAMMES	2.0
TR	TALENT-READINESS	2.0
PC	PEOPLE-CENTRICITY	1.0
IE	INNOVATION ECOSYSTEM	2.0
SM	SMART POLICIES	2.0
TD	TRACK RECORD	2.0

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50 KIGALI

Building the foundation of an innovation ecosystem

Kigali aims to build on its strength as one of the most business-friendly cities in Africa, to build an innovation ecosystem which produces technologies necessary for smart city initiatives and projects. The City set the ambitious goal of attracting more than USD 1 bn in information and communication technology investments by 2020.

To achieve this goal, the City created an innovation hub, the Kigali Innovation City, to develop and commercialize technology applications for the global market. The hub is situated within a special economic zone where firms are offered preferential tax rates, tax holidays, and custom duty waivers. The development of the hub rests on three pillars: Digital innovation; Human capital; and Financial capital. For instance, seven industries were identified as focus areas, and relevant firms are encouraged to set up innovation labs within each industry cluster. An industry skills academy develops training and capacity-building programmes for professionals. The ecosystem will also be further supported with public, philanthropic, and angel funds for firms at different growth stages.

The Rwandan Government has also recently launched its USD 100 mn National Research and Innovation Fund, a key initiative supporting the Kigali Innovation City. Created in partnership with private investors and the African Development Bank, the fund supports small- and medium-sized enterprises to develop and implement technology innovations.

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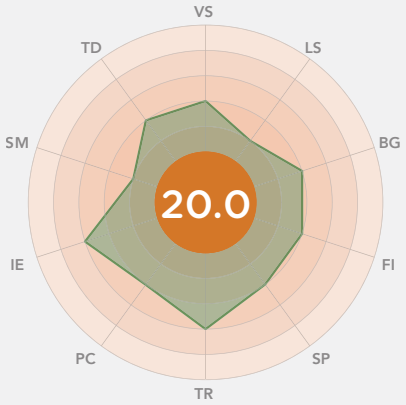
SMART CITY GOVERNMENT SCORE



VS	VISION	2.0
LS	LEADERSHIP	1.0
BG	BUDGET	2.0
FI	FINANCIAL INCENTIVES	2.0
SP	SUPPORT PROGRAMMES	2.0
TR	TALENT-READINESS	3.0
PC	PEOPLE-CENTRICITY	2.0
IE	INNOVATION ECOSYSTEM	3.0
SM	SMART POLICIES	1.0
TD	TRACK RECORD	2.0

ABOUT US

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Markets · Innovation · Sustainability

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OXD (ONG&ONG Experience Design) is the Experience Design consultancy arm of ONG&ONG. We work with clients in the area of innovation to transform their organisations to become more user-centric and customer focused. We believe that the process of design thinking is a powerful tool for transformation and through our partnership with many clients, have leveraged on this to bring about impact in organisations both internally and externally.

We believe that the future of cities is not just about harnessing technology to create the right systems for growth and new possibilities, but doing so in a way that reflects a deep understanding of the human condition and the transformative power of citizen ownership and empowerment. This human-centric approach to designing for the city will ultimately yield more sustainable impact and a more resilient, adaptable city and beautiful city, inside and out.

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