

Think:Act

navigating complexity

SMART CITY
STRATEGY INDEX
2019



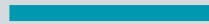
March 2019

The Smart City Breakaway

How a small group of leading digital cities is outpacing the rest

THE BIG

3



153

cities around the world, both large and small, have published an official Smart City strategy.

Page 4

15

of these have plans that demonstrate a comprehensive strategic approach.

Page 8

8

of the 15 are at an advanced stage of implementation.

Page 13

It takes a good strategy and strong implementation to build a Smart City. Only 8 cities have these.

Today's cities are very often victims of their own success. Growing populations overwhelm the world's megacities, and many smaller ones too. Urban sprawl eats up surrounding nature, whether in the form of shanty towns or luxury housing. Congestion causes chaos in cities from Addis Ababa to Zurich. Pollution smothers even the most futuristic city. And no metropolis is free from the danger of natural disasters. The list goes on.

While there is no cure-all for such problems, our rapidly digitalizing world does offer a potential answer: the Smart City. By harnessing a range of coordinated digital solutions, city authorities and providers can address structural challenges from urban planning to mobility and environmental services. Want an app to involve citizens in planning decisions? Need a smart traffic management system to prevent rush-hour congestion? Interested in green infrastructure to lower emissions? No problem, there's a Smart City solution for each.

Such innovations aim to address urban challenges by providing digital services and solutions that benefit citizens, businesses and civil society. Yet without a strategic approach to integrate, coordinate and organize these solutions, Smart Cities will never reach their full potential. It is the key to success.

That's why Roland Berger has developed the Smart City Strategy Index (SCSI), which measures the compre-

hensiveness and ambition of urban centers against the key ingredients of a Smart City. Our first version of the SCSI was published in March 2017 and analyzed the plans of 87 cities. But with Smart Cities advancing so rapidly, we decided there was a need for a second version.

As laid out in this report, SCSI 2019 identifies 153 cities with an official Smart City strategy and analyzes and ranks each one. The Austrian capital Vienna again tops the list, followed by London in the UK and St. Albert in Canada.

Overall, SCSI 2019 shows that while the number of cities with an identifiable official Smart City strategy is growing, many remain without one. For example, among the roughly 500 cities worldwide with a population of more than one million (UN estimates), we found only 49 with an official Smart City strategy.

Where such strategies exist there is often much room for improvement around the plans themselves and their implementation. To address this, we deliver recommendations to cities, solution providers and governments on how to build a successful Smart City, and overcome barriers to implementation.

In short, SCSI 2019 provides a global overview of Smart City strategies, gives real-life examples of what cities are doing, and offers advice on how to develop or improve their approach.

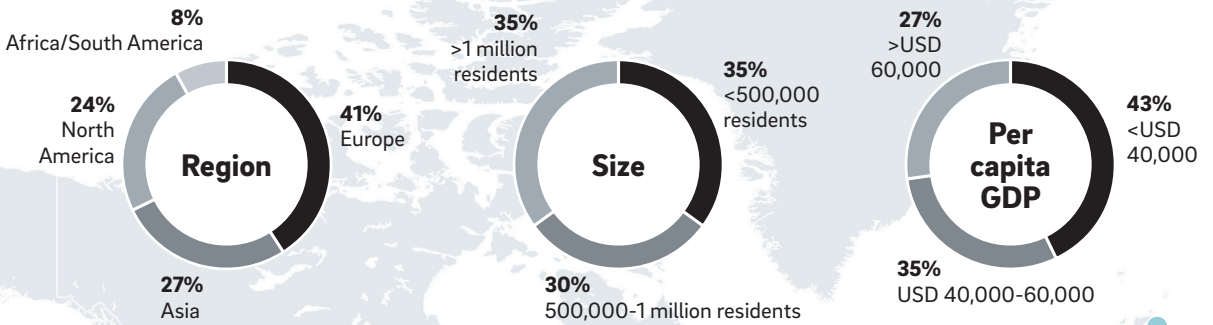
A

SCSI 2019 CITIES IN NUMBERS

153 cities worldwide have an official Smart City strategy

THEY ARE FOUND ACROSS REGIONS AND IN ALL SIZE AND WEALTH CATEGORIES

Strategies by category [%]



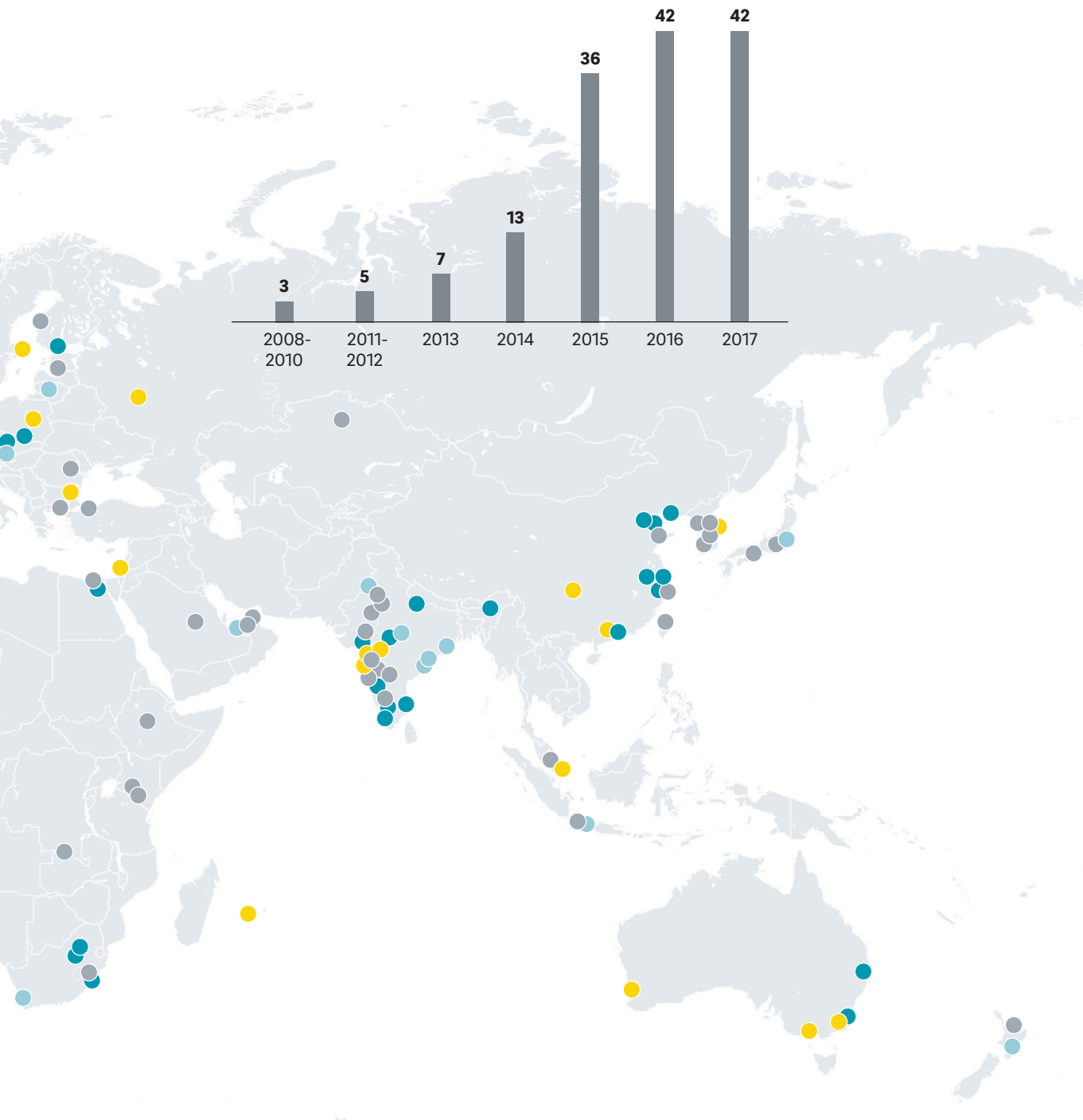
MOST OF THE SCSI 2019 STRATEGIES ARE NEW COMPARED TO SCSI 2017

SCSI 2019 cities

- City in SCSI 2019 with a new strategy that was not covered in SCSI 2017 (new) ▶ 57%
 - City in SCSI 2019 with an updated strategy compared to SCSI 2017 (updated) ▶ 25%
 - City in SCSI 2019 with the same strategy as covered in the SCSI 2017 (old) ▶ 18%
-
- City with (mostly unofficial) Smart City strategy documents not included in the SCSI 2019

THE NUMBER OF PUBLISHED STRATEGIES IS INCREASING

Strategies published per year [number]



A strategic approach is the key to building a Smart City. We have identified and compared 153 strategies from small and large cities alike to find the best.

Successful Smart Cities tend to have one thing in common – a sound strategic approach. This ensures the integration of different strands and avoids ad hoc solutions. For example, e-mobility services are fairly simple to introduce to a city, but a Smart City would also integrate them into intelligent traffic management systems and power them via smart electricity grids. Strategies also promote cross-sectorial solutions, such as data platforms, sensor networks and service integration. In addition, they help to set out a timeline and responsibilities for implementation.

For SCSi 2019, we identified more than 250 cities with openly accessible Smart City strategy-related documents. Of these, 98 (39 percent) were from cities with less than 500,000 inhabitants, demonstrating increasing momentum among smaller cities.

Of the 250, we selected 153 that had published official strategies. This is almost double the number in SCSi 2017. The equal share of small, medium and large cities underlines that size is not an indicator of the existence of a strategy. → [A](#)

How did we analyze them? First, using SCSi 2017 as a basis, we applied 12 criteria that are key to a comprehensive Smart City strategy. Six are related to concrete areas in which solutions can be implemented, such as buildings and mobility. These are called action fields. The other six criteria are factors that contribute to the framework of concrete Smart City activities – or so-called enablers. The 12 criteria are split into a total of 31 sub-criteria, each with a separate weighting depending on its overall importance. → [B](#)

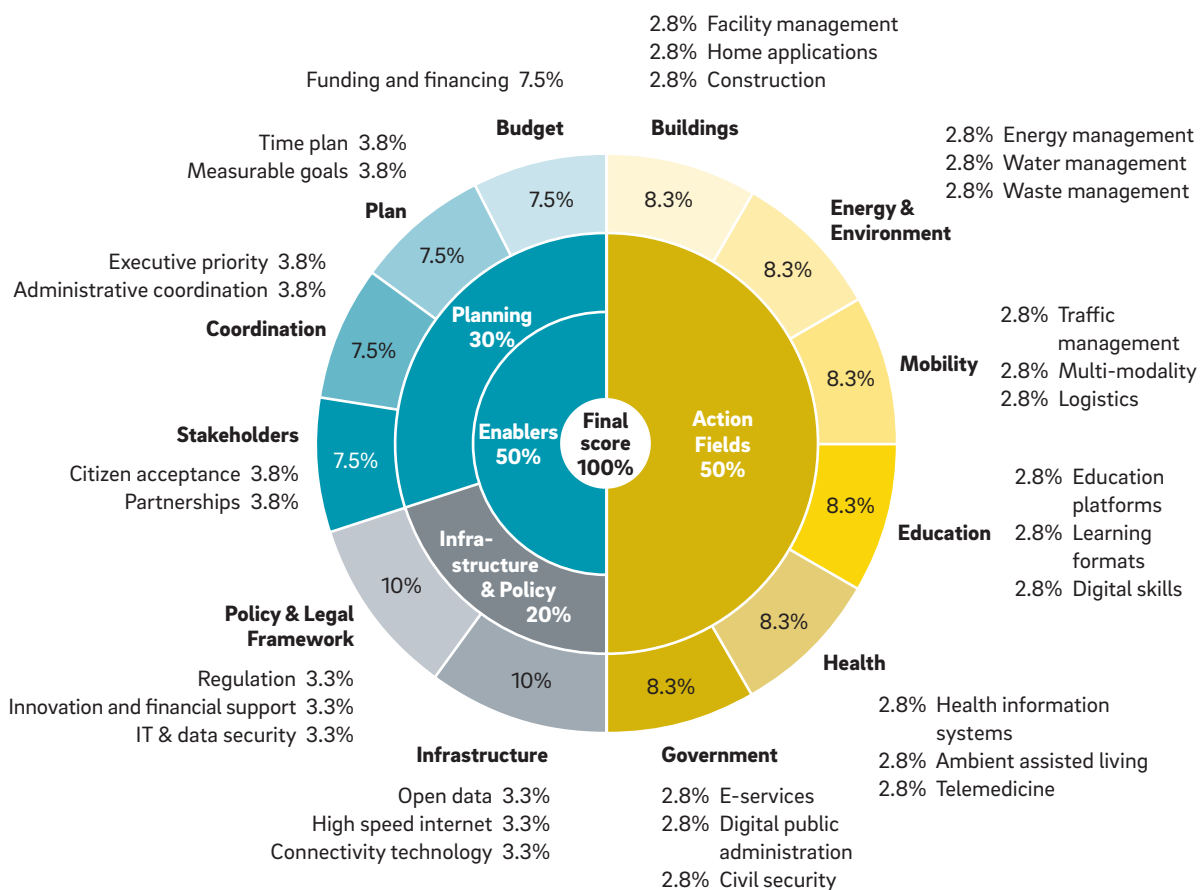
Based on this methodology, we assessed the comprehensiveness of the 153 strategies. To do so, we assigned a score of up to 100 points for each of the sub-criteria, based on the level of detail that the city's strategy documents provided about activities, targets and level of ambition. Applying the weights, a total score was then calculated from the sub-scores with a maximum of 100 to be reached.

Strategic approaches earning a score of 60 points or more are considered comprehensive, meaning a city has detailed activities and targets of at least moderate ambition for key aspects of a Smart City across the 12 criteria.

B

THE SCS1 2019 ASSESSMENT FRAMEWORK IS BASED ON 3 SMART CITY DIMENSIONS, 12 CRITERIA AND 31 SUB-CRITERIA

Dimensions, criteria and sub-criteria and their weights



A small and growing number of cities have comprehensive smart strategies. But most have considerable room for improvement.

Our overall finding is striking: Just 15 cities (10%) meet or exceed the 60 point score that indicates a comprehensive smart strategy. The average score is 41, with 40% of cities scoring between 40 and 60 points, and 50% below 40. → [C](#)

As in SCSi 2017, Vienna finishes top of the pile with a score of 74 (see box: SCSIs head to head). The Austrian capital has updated its 2015 framework strategy with a digital agenda, and scores highly due to factors such as its robust system of performance monitoring. This has improved coordination and cooperation between activities and individual players, and helped to sharpen its smart objectives ahead of another strategy update.

London in the UK and St. Albert in Canada finish close behind. London updated its strategy in 2018, while newcomer St. Albert recently launched a comprehensive master plan. Both cities have a strong focus on the application of technology and innovation across action fields.

Asian cities dominate the rest of the top 15. Chinese cities fare best, with five top finishers from Shanghai in sixth place to Guangzhou in fourteenth. All have five-year smart plans as part of the country's Smart City initiative. Singapore, Seoul and the Indian city of Davanagere are also among the top 15.

Taken as a whole, the 153 strategies also throw up some surprising results. Despite Europe and North America contributing the highest number of cities and some of the best strategies, it is Asian cities that perform best on overall score. They have an average score of 48.2, compared to 41.8 in North America and 37 in Europe. In addition, Asian cities all score above 20 points, while the worst performers in the two other continents score as low as 11. → [D](#)

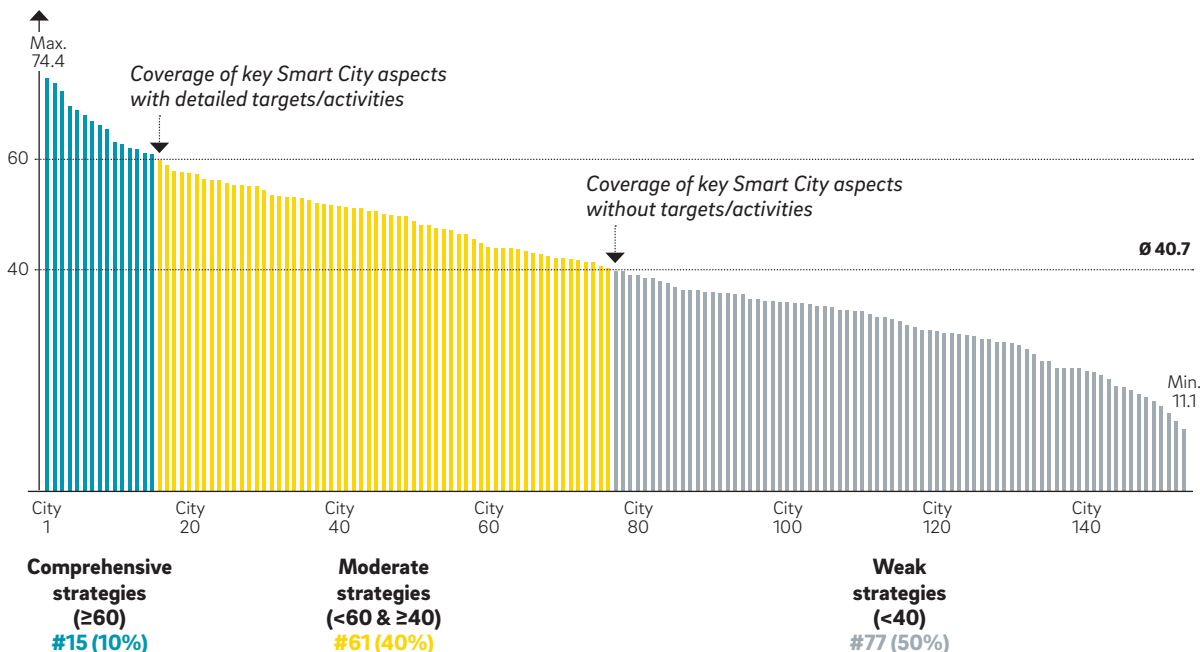
Overall the gap within the top 15 cities is narrowing, indicating that more cities are catching up with Vienna. We also see that city size is an indicator of the quality of a strategy, but wealth does not seem to limit the development of good strategies.

C

ONLY 15 OUT OF 153 SMART CITY STRATEGIES REACH SCORES ABOVE 60

Strategies by total score [max. 100]

Coverage, ambition, means of implementation



Source: Roland Berger, SCSi 2019

THE RESULTS SHOW A POSITIVE TREND OVER TIME

SCSIs head to head

	SCSi 2017	SCSi 2019
Strategies' publication date	Up to end of 2015	Up to mid-2018
Number of cities	87	153
% over 60 points	7	10
Average score	37	41
Points between 1st and 15th	21	14
Top 3	Vienna Chicago Singapore	Vienna London St. Albert

D

COMPREHENSIVE SMART CITY STRATEGIES (TOP 15)¹

The best performing cities come from all around the world – many from Europe and East Asia

St. Albert [72] 2016
A newcomer with a very comprehensive Smart City master plan comprising 22 strategy fields with strong technology and innovation aspects

3

Birmingham [67] 2015
Strong digital roadmap from 2015 complemented by an ICT & digital strategy

7

2

5

Chicago [69] 2015
First ever public-private technology plan from 2013 complemented by an 18-month update in 2015

Santander [62] 2010
Smart City master plan with a focus on innovation

10

Paris [63] 2016
Comprehensive strategy for a smart and sustainable city

1

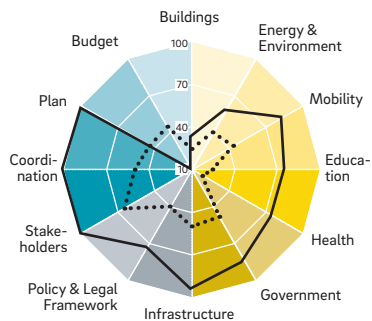
VIENNA LEADS THANKS TO ITS STRONG STRATEGY FRAMEWORK AND DIGITAL AGENDA

The Top 3

1 Vienna

Country: **Austria**
Population²: **1.7 million**

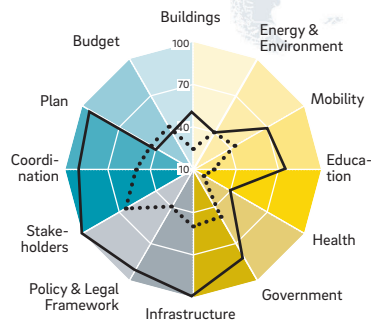
Smart City Wien/Digital Agenda Wien (2015/2017)
Total score: 74



2 London

Country: **United Kingdom**
Population²: **8.3 million**

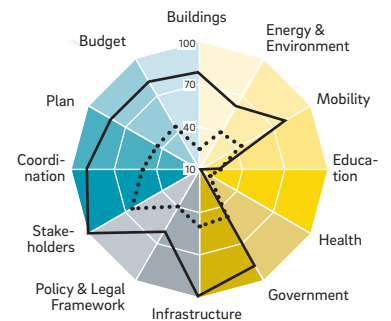
Smarter London Together (2018)
Total score: 73



3 St. Albert

Country: **Canada**
Population²: **0.1 million**

Smart City Master Plan (2016)
Total score: 72

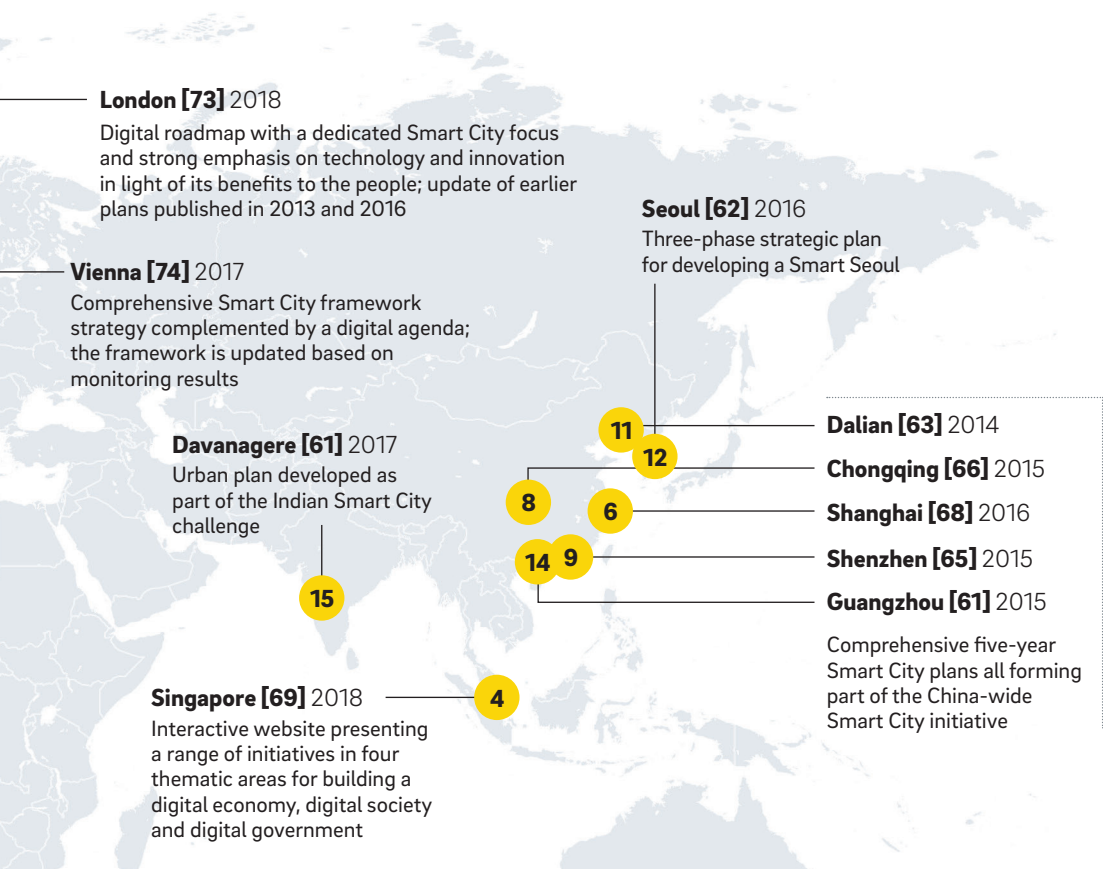


..... Overall average

Source: Roland Berger, SCSi 2019

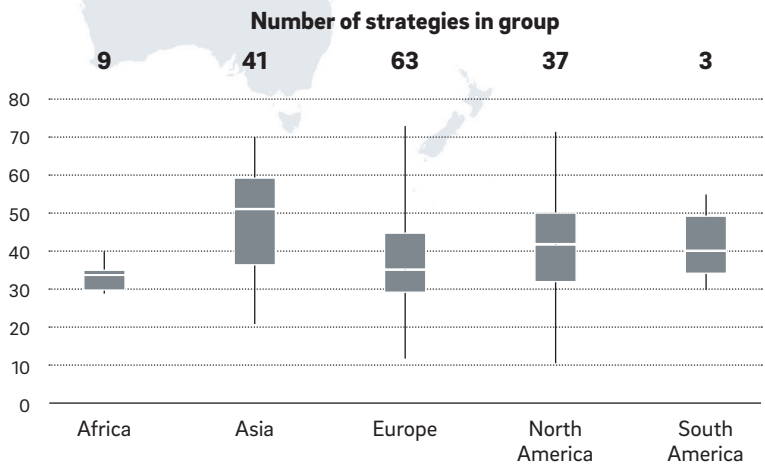
1 [x] Score achieved in SCSi 2019 out of a total score of 100

2 City population measured by number of people living in urban agglomeration or city proper



WHILE TOP STRATEGIES CAN BE FOUND ACROSS THE WORLD, ON AVERAGE ASIAN STRATEGIES PERFORM BEST

Overall scores by geographic region³ [score]



³ Vertical lines illustrate the range of scores reached within the region, the box illustrates the range between the first and third quartile and the white horizontal line is the median

SELECTIVE APPROACHES

Average scores across the 12 criteria and 31 sub-criteria vary widely, although most show considerable upscale potential. The highest scores are achieved among the strategic planning criteria, with stakeholders (62) and coordination (51) particularly well addressed. Overall, cities secure 50% of the available points in this dimension. Scores in the IT infrastructure and policy dimension are close behind, while the action fields scores are the lowest, with health (20) and buildings (22) at the bottom. Only 33% of the available action fields points are taken, meaning that on average hardly any activities or targets are identified, let alone implementation plans. → E

Overall, cities tend to take a selective approach to their strategies, for example focusing on fields such as

government or mobility at the expense of education and health.

The best strategies (based on overall score) have a smaller gap between enabler and action fields criteria, with the latter scoring higher. This means they emphasize enablers as well as ambitious activities and targets for specific solution areas.

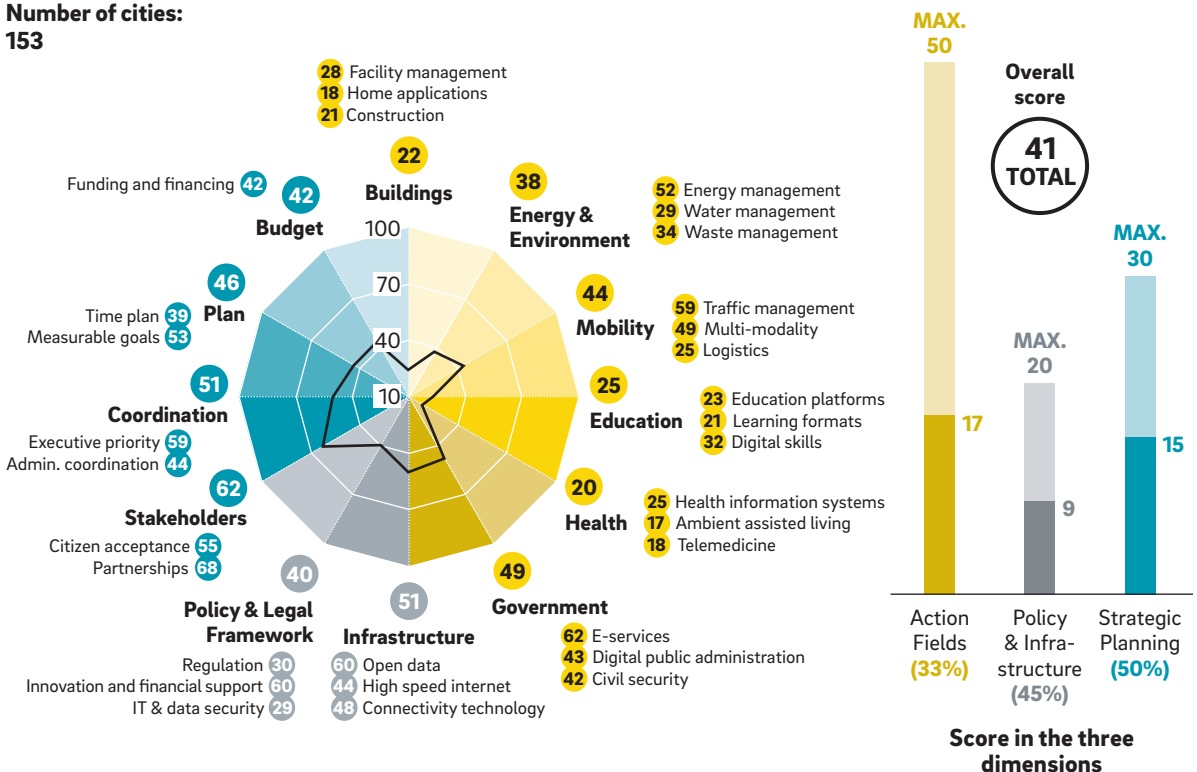
But only a few back up a comprehensive approach to action fields with the necessary strategic enablers. For example, fewer than 10% of cities reach the 60 point threshold for their enabling environment and activities in one of the following action fields: buildings, health and education. And no more than 20% do so for the other three action fields of energy & environment, government and mobility.

E

ON AVERAGE, STRATEGIC PLANNING AND POLICY & INFRASTRUCTURE ARE BETTER COVERED THAN ACTION FIELDS

Average of all cities' scores for each of the criteria [max. 100]

Number of cities:
153



Strategies are the key to Smart Cities, but they are meaningless if not acted upon.

Yet in many places implementation progress remains slow.

For cities, a smart strategy is not enough – it must be brought to life by action on the ground. To get an idea of progress in this area, the second part of our study assessed the level of implementation in the top 15 cities. To do this, we created a database from official city information and other online sources to evaluate and score four implementation factors: capability (has the city assigned implementation responsibilities?); scope (how many action fields do the city's flagship projects cover?); status (what is the progress of the flagship projects?); and results tracking (is a monitoring framework in place?).

The results reveal that while the launch of Smart City solutions is well underway, progress is underwhelming. Just 8 of the 15 cities show advanced implementation progress, indicating mostly high capability, a wide scope with projects from most action fields, ac-

tive or completed projects and some form of results tracking. Vienna again leads the way, this time followed by Singapore and London. Chicago and Shanghai also show evidence of good progress. →[E](#)

FACTOR BREAKDOWN

The leading cities perform best when it comes to capability. Vienna, for example, has introduced the Smart City Vienna Agency, a central coordination unit that promotes links between the city administration, research, business and industry. Similar agencies in Singapore, Chicago, Shanghai and Birmingham drive a high capability score. Meanwhile, London has appointed a Chief Digital Officer advised by a board of Smart City experts. Cities where responsibility for implementation still lies with town halls do not perform so well.

F

VIENNA LEADS IN IMPLEMENTATION

Implementation status of comprehensive Smart City strategies

	Implementation progress ¹	Implementation attributes	Example cities	Selected flagship projects
1. Advanced 3 cities		High capability Broad project scope Completed or active status Full results tracking	Vienna Singapore London	E-Health, Open Public Data, Virtual Office Digital & Sensor Platforms, National Digital Identity Open City Data Ecosystem, Sensor Infrastructure
2. Good progress 5 cities		High-medium capability Selected project scope Completed or active status Only project tracking	Chicago Shanghai Birmingham Seoul Guangzhou	Open Grid, Data Platform, Smart Health Centers Data Center, Health Big Data, Government Information System Big Data Corridor, Smart Routing App Open Data Plaza, Open e-Gov Digital ID Card, AI-Based Weather Forecasts
3. Implementation followers 7 cities		Low-medium capability Limited project scope Active or concept status No tracking	St. Albert Chongqing Paris Shenzhen Dalian Santander Davanagere	Public E-Services, Building and Lighting Control Intelligent Community Management, Traffic Support System Open Data, Routing App, Public Feedback Platform City Operations Platform, Early Warning System Industrial Cloud Computing, Traffic Guidance System Cloud City Center, Traffic Monitoring Digital Waste Management, Intelligent Traffic Management

¹ Based on an assessment measuring implementation progress as implementation capacity (20%), scope (40%), status (20%) and results (20%); a maximum of 100 points can be reached

70-90 points
 60 points
 Up to 50 points

Only a few cities demonstrate a wide implementation scope. Vienna is again the leader here, with multiple projects across all action fields, ranging from the expansion of wi-fi access points to the testing of smart traffic lights and a virtual office for citizens to complete bureaucratic tasks. Singapore also does well on scope. Innovations in the city-state include smart lighting, autonomous shuttles and telemedicine solutions. Meanwhile, London is developing smart street infrastructure, such as lamp posts and benches, that provide functions including wi-fi, air quality sensors and electric vehicle charging points.

When it comes to the implementation status of projects, most of the 15 top cities have either completed or are piloting flagship projects. For example, Vienna was the first city in the German-speaking world to publish public data and is one of the pioneers in Open Government Data. And Singapore is piloting a National Digital Identity scheme. The SingPass authentication system allows citizens to access hundreds of digital government services and transact securely with private companies.

Most cities also track the progress of such projects, but Vienna and London have gone one step further. The Austrian capital not only evaluates individual projects, but also measures progress towards its long term goals, such as reduced emissions. Meanwhile, London has launched an online platform enabling anyone to monitor the progress of projects in real time. Such systems ensure a high degree of transparency, highlighting both successes and areas of potential improvement.

BARRIERS TO IMPLEMENTATION

The rollout of Smart City solutions is not all plain sailing, however. Using our experience we have identified several common barriers to implementation, which help to explain why many of our cities are yet to reach their full smart potential.

No two cities are the same. The level of commitment, the project landscape and the interests of involved parties differ significantly and make the journey to become a Smart City challenging. There is no single blueprint for how to get there. This adds to the complexity of the Smart City journey. In addition, preparations require technical know-how, strong organizational skills and best-practice examples. Yet these are often difficult to come by.

"Using our experience we have identified several common barriers to implementation, which help to explain why many of our cities are yet to reach their full smart potential"

A lack of technical capacity is also a problem in itself. Smart City solutions frequently involve time-consuming and complex preparation, and city authorities often do not have the time and expertise to pull them off. Top city officials must also set clear priorities to align interests and secure support from all stakeholders.

Regulation also hampers development. Smart Cities require a regulatory framework to oversee the use of new technologies and data. But this only adds to existing regulatory and administrative burdens, complicating implementation.

Moreover, Smart City solutions often have high ramp-up costs, coupled with uncertain returns and long payback periods. This makes upfront funding difficult to secure. The fact that most smart solutions are novel and built around untested business models is another hurdle.

But the most difficult problem to overcome is also the least tangible: resistance to change. Smart City solutions often involve radical new ideas, and citizens and stakeholders may have little understanding of their benefits. Instead they see short-term upheaval, making projects a difficult sell. Vienna seems to have nailed such problems thanks to concerted communication efforts during the implementation of projects.

There's no need to get left behind.

Our recommendations advise city planners, solution providers and governments on how to build a Smart City. The success of a Smart City depends on the actions of three key groups: city planners, solution providers and national/regional governments. Based on our extensive research and knowledge from our work with cities and technology companies, we offer recommendations on strategies and implementation for each.

CITY PLANNERS

7 POINTERS TOWARDS THE PERFECT SMART CITY DESIGN

Cities themselves play the lead role in "going smart", as they act as a central platform for stakeholders and manage the planning framework.

Take stock

A Smart City strategy presents the perfect opportunity to re-evaluate the role of the city and define its digital services and project portfolio accordingly. This exercise requires taking stock of existing plans and projects.

Involve all stakeholders

To guarantee buy-in, all stakeholders, including citizens and third party providers, must be involved in strategies and implementation. Guaranteeing partnerships and citizen involvement will aid this.

Think integrated

Smart Cities rely on clearly defined action fields underpinned by sound strategic enablers in all areas of digitalization. An integrated approach emphasizes both and identifies links between solutions.

Get private support

The private sector is key to providing expertise and funding. Companies can not only develop new technologies but also contribute business models to finance new solutions.

Foster innovation

There is no blueprint for the perfect Smart City, so cities should not be afraid to encourage entrepreneurs to try new solutions. Innovation labs as well as technical and financial support will help.

Establish (open) urban data platforms

Data is the lifeblood of a Smart City. Most solutions work better the more they have, meaning data platforms are key. And developing strong cybersecurity policies will help to keep them safe.

Make concrete action plans

Action plans make strategies come to life by defining milestones, sources of funding and implementation activities. These should be updated regularly to keep up with development.

SERVICE AND SOLUTION PROVIDERS

7 WAYS TO ACHIEVE A SOUND SMART CITY BUSINESS MODEL

Solution providers are key in bringing solutions to the ground by developing new technologies and business models.

Know your customer

Aspiring Smart Cities share common challenges, but also face specific problems and have different starting points. Solution providers therefore need to understand the particular needs of a city.

Identify relevant buying centers

Stakeholders and buying centers are usually scattered across cities and organizations, with no direct sales channels. Providers can benefit by establishing points of contact, including via channel partners.

Prioritize cities and solutions

There are currently a large number of Smart City projects, which vary in ambition and maturity. As such, providers need to prioritize those cities and solutions with the best upscaling opportunities.

Adopt horizontal solutions

Cities often focus on narrow trial projects, such as in mobility, at the expense of wider cross-industry solutions. This means that providers offering horizontal solutions can gain an advantage.

Be holistic

With digital expertise lacking among cities, providers will benefit by offering value-add through an integrated, consultative approach that covers several solutions, rather than just offering hardware.

Develop business models

Few Smart City business models have been robustly tested. So while providers can subsidize projects to gain a foothold, they must be sure to develop self-sustaining business models to generate returns.

Establish partner networks and ecosystems

With such a diverse range of actors in play, from public utilities to IT suppliers, providers that create and manage networks of players will be best positioned to implement holistic solutions.

NATIONAL/REGIONAL GOVERNMENTS

7 STEPS TOWARDS THE PERFECT SMART CITY PLATFORM

National and regional governments act as enablers by providing incentives and guidance for Smart Cities, as well as support with solutions.

Map initiatives

Smart City initiatives often take place at various different levels, from local to international. Mapping them creates transparency about opportunities and helps to demonstrate best practices.

Create information platforms

National Smart City alliances connect city planners, CDOs, public companies and solution providers, pooling resources. Germany's "Stadt.Land.Digital" initiative and Spain's Red Española de Ciudades Inteligentes are shining examples.

Develop guidelines

Setting out the main elements and ideas behind a Smart City helps cities to prepare and implement strategies. China has led the way, providing central guidance used by over 200 pilot Smart Cities.

Establish data frameworks

National Smart City data frameworks support data collection, analysis and exchange at a local level, and also ensure compliance with national laws. Data infrastructure can also help to pool data.

Mobilize funding

Relevant funds, such as the Smart Cities & Communities stream of the EU's Horizon 2020 program, can kick-start projects and also cover the funding needs of developing business models.

Run competitions

Laying down challenges incentivizes the development of new ideas and solutions, and can also be tied to financial and technical support. Germany, the USA and India have all run successful Smart City competitions.

Promote knowledge sharing

Regional, national and international events and workshops bring decision makers and practitioners together to facilitate learning. They also promote knowledge exchange and help to build capacities.

MINI CASE STUDIES

CITY PLANNERS

XUHUI IN SHANGHAI, CHINA

The Xuhui district of Shanghai placed much emphasis on integration in its comprehensive Smart City strategy. Planners integrated ideas for various key areas into an overall vision, combining applications and solutions in, for example, smart education, smart medicine, smart transportation and smart tourism. The plans are backed up by support infrastructure, the development of business clusters and an investment marketing strategy.

SERVICE AND SOLUTION PROVIDERS

CAISSE DES DÉPÔTS, FRANCE

The French state financial institution Caisse des Dépôts conducted a thorough market and customer analysis to develop financing models for Smart City solutions in the areas of transportation and buildings. It first systematically evaluated the urban solutions market to derive new opportunities for commercial offerings. Using a Smart City maturity index, it then selected cities for testing these offers.

NATIONAL/REGIONAL GOVERNMENTS

"STADT.LAND.DIGITAL", GERMANY

The German government is driving Smart City development through a dedicated initiative. The project is designed to unite the country's Smart City community and support municipalities in developing smart strategies. It offers best practice advice and workshops, facilitates Smart City-related dialogue and networking, and regularly publishes studies and newsletters on Smart City topics. In 2018, it ran a Smart City competition with over 200 proposals. www.stadt-land-digital.de

In order to assess the status of your Smart City approach, we recommend using our free and simple online self-assessment tool (at rb.digital/SmartCityStrategyIndex).

The tool leads you through a set of questions, which take about 30 minutes to answer. You then receive your Smart City Strategy Index score and customized feedback on how to improve your city's approach.

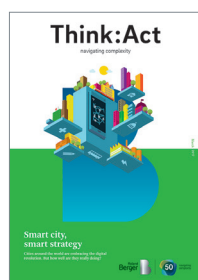
ABOUT US

Roland Berger, founded in 1967, is the only leading global consultancy of German heritage and European origin. With 2,400 employees working from 34 countries, we have successful operations in all major international markets. Our 50 offices are located in the key global business hubs. The consultancy is an independent partnership owned exclusively by 230 Partners.

Navigating Complexity

Roland Berger has been helping its clients to manage change for half a century. Looking forward to the next 50 years, we are committed to supporting our clients as they face the next frontier. To us, this means navigating the complexities that define our times. We help our clients devise and implement responsive strategies essential to lasting success.

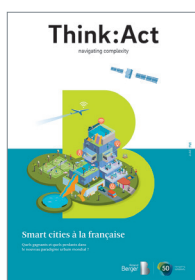
FURTHER READING



SMART CITY, SMART STRATEGY

Cities around the world are embracing the digital revolution. But how well are they really doing?

In our first version of the Smart City Strategy Index from 2017 we put the spotlight on 87 metropolises around the globe to analyze how cities are embracing the smart revolution – and the multi-million dollar market it has created. The results show that the smartest cities come in all shapes and sizes and that most cities still have substantial room for improvement. We identify ten key pointers for cities to becoming smart.



SMART CITIES À LA FRANÇAISE

Quels gagnants et quels perdants dans le nouveau paradigme urbain mondial ?
(Who are the winners and losers of the new urban paradigm?)

This study measures the maturity of Smart City markets in French cities. Results show that most cities still have a low maturity level when it comes to facing challenges in the development of Smart City approaches. The study further estimates that a total of ca. EUR 10 bn of budget savings per year could be realized at the municipal level through Smart City solutions.

LINKS & LIKES

ORDER AND DOWNLOAD

www.rolandberger.com

STAY TUNED

www.twitter.com/RolandBerger

LIKE AND SHARE

www.facebook.com/RolandBergerGmbH

Publisher

ROLAND BERGER GMBH

Sederanger 1
80538 Munich
Germany
+49 89 9230-0

WE WELCOME YOUR QUESTIONS, COMMENTS AND SUGGESTIONS

THILO ZELT

Partner
+49 30 39927-3480
thilo.zelt@rolandberger.com

DR. ULF NARLOCH

Project Manager

BENEDIKT EIKMANNS

Consultant

JULIUS IBEL

Consultant

Our international Smart City contributors and experts

Pierre Bastien, Belgium
Andreas Buelow, Middle East
Alain Chagnaud, France
Benno van Dongen, Netherlands
Youngdae Kwon, South Korea
Gustavo Lopes, Brazil
John Low, Southeast Asia
Paolo Massardi, Italy
Daniel Riscado, Portugal
Raymond Wang, China