

ESI THOUGHTLAB

Smart City Solutions for a Riskier World

Regional scorecards

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Research background



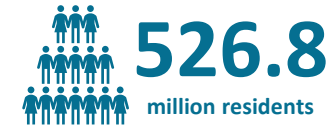
Research scope and methodology

COVID-19 has accelerated the need for cities around the world to adopt innovative solutions to achieve their social, environmental, and economic goals. But the priorities and solutions vary by region—and within regions, based on a city's population size, development maturity, and other factors.

To help city leaders compare their practices and progress against those of peers, ESI ThoughtLab has collaborated with a global coalition of business, government, and academic leaders to conduct a comprehensive benchmarking study on 167 cities across six world regions: Africa, Asia Pacific, Europe, Latin America, Middle East, and North America.

Titled **Smart City Solutions for a Riskier World**, this study covers cities across 82 countries, with various income levels and population sizes—representing nearly 7% of the global population.

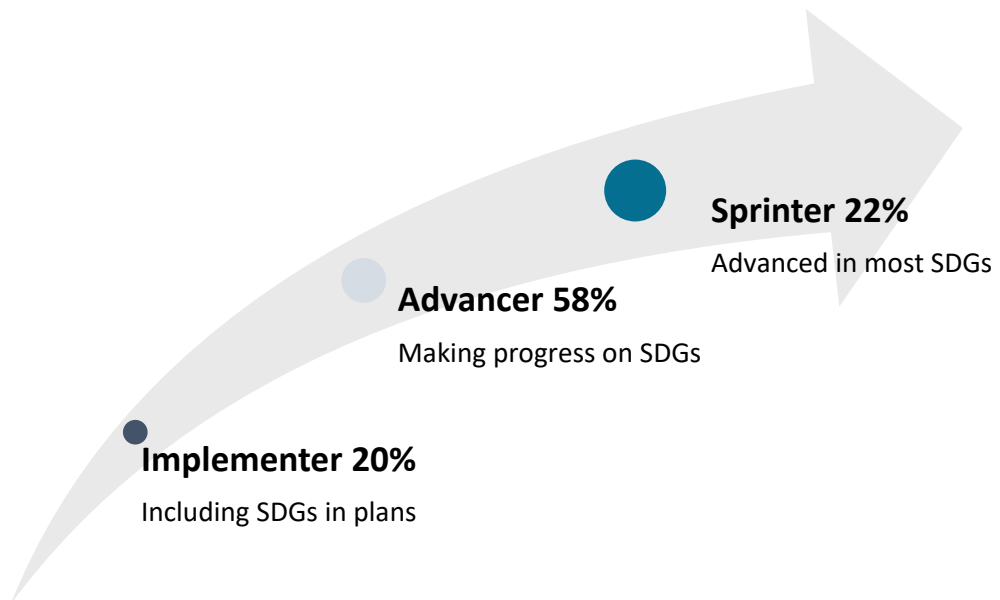
Using the UN's 17 Sustainable Development Goals as the analytical framework, the research examines how cities across regions have leveraged digital technologies and data, together with public-private partnerships and policy initiatives, to achieve the SDGs. This report outlines those solutions, and which work best by region.



The three stages of SDG progress

A prime objective of this research was to assess how smart urban solutions such as digital technologies and partnerships can help cities achieve the SDGs. To measure the progress that cities have made in driving the SDGs, we developed an SDG progress framework.

Our framework categorizes cities into three groups: implementers, which are in an early stage of SDG adoption; advancers, which are making progress on a range of SDGs; and sprinters, which are making fast progress on most areas of sustainable development. Twenty percent of cities are classified as implementers, 58% as advancers, and 22% as sprinters.



Our SDG progress framework

We categorized each city into three stages of sustainable development progress: implementers, advancers, and sprinters. Our economists classified cities based on their scores across the following criteria:

1. The number of SDGs a city has included in its plans

2. The progress a city has made on each of the SDGs

3. The steps a city is takes to achieve the SDGs:

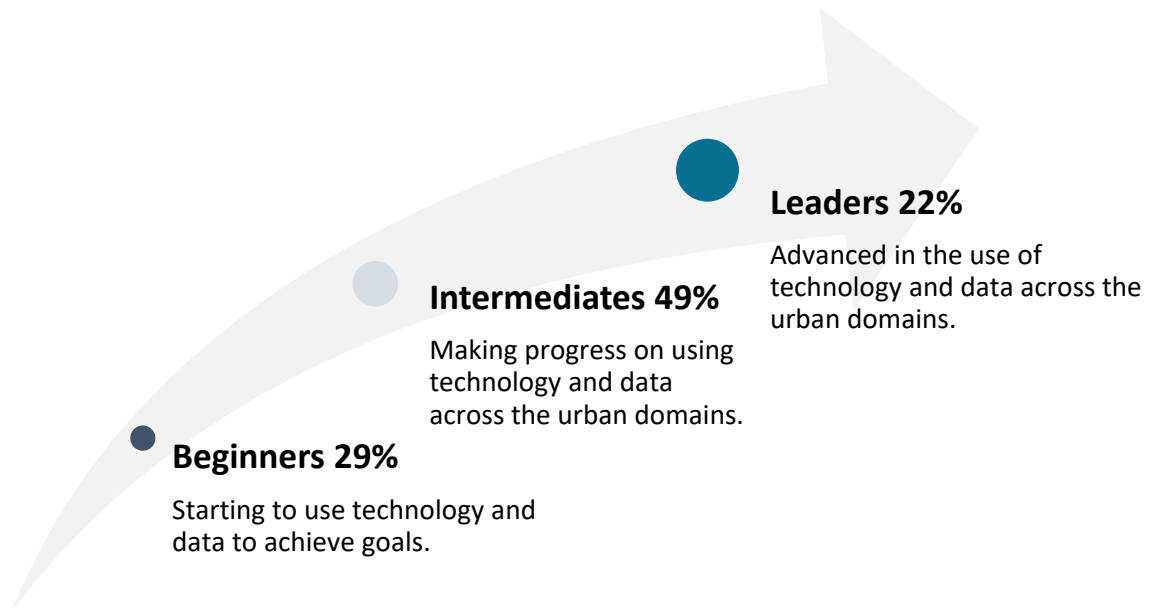
- Regularly monitors SDG efforts
- Assesses areas where the city lags
- Designates a department to implement SDGs
- Gathers high-level support for their SDG program
- Conducts a voluntary local review (VLR)
- Enjoys a reputation as a leader in SDG adoption

Classifying smart city maturity

Our economists also created a smart city maturity framework to assess which cities are ahead in using digital solutions and technologies to achieve their social, environmental, and economic goals. We classified cities based on their progress on harnessing technology and data across the urban domains, as well as their ability to foster citizen and stakeholder engagement. Twenty-nine percent of cities are classified as implementers, 49% as advancers, and 22% as smart city leaders.

Some cities are ahead in both SDG progress and smart innovation. We have classified these as Cities 4.0. There are 20 such cities in our survey.

The following regional scorecards present a snapshot of the smart, sustainable solutions used to drive progress in six regions of the world.



Our smart city maturity framework

We categorized each city into one of three stages of smart city maturity: beginners, intermediates, and leaders. Our economists classified cities based on scores across the following criteria:

1. Level of digitization across the urban domains
2. Competence in using data and analytics
3. Progress on fostering citizen engagement

We applied an additional filter for leaders. To be classified as a leader, a city had to self-identify as either advanced or very advanced in its implementation of smart city initiatives.

Regional scorecards

| | | | |
|------|---------------|---|------|
| 339 | MÜNCHEN | 2 | 1950 |
| 933 | BERLIN-TEGEL | 2 | 1950 |
| 8260 | FRANKFURT | 2 | 2000 |
| 5525 | BUDAPEST | 2 | 2000 |
| 1508 | PARIS-CDG | 2 | 2000 |
| 3248 | ISTANBUL | 2 | 2000 |
| 939 | HURGHADA | 2 | 02 |
| 2378 | IZMIR | 1 | 03 |
| | FUERTEVENTURA | 2 | 0 |



Africa SDG scorecard

Operating in developing countries with challenging social, sustainability, and economic issues, African cities struggle more with the SDGs than those in advanced economies. Just 58% of African cities have adopted the SDGs framework into their plans (only Asian cities are lower), and only 31% on average report notable progress on their goals—the lowest of any region.

With rising temperatures and sea levels threatening their citizens and economies, it is not surprising that African cities are moving most aggressively on climate action. They are also making moderate advances on partnerships, education, poverty, health, gender equality, decent work, and life on land.

Notably, one African city, Accra, stands out as a sprinter within our SDG maturity framework. It has made more headway on the SDGs, has adopted several SDG best practices, and has taken an innovative approach to funding.

Most progress on SDGs



Climate action

58%



Partnerships for the goals

47%



Education; no poverty; health; gender equality; decent work; life on land

42%

Least progress on SDGs



Affordable & clean energy

0%



Clean water

11%



Industry, innovation; peace & justice; sustainable cities

16%

Average ROI

| Safety & security | Energy & water | Environment |
|--|---|---|
| Facial recognition & biometrics 7.15% | Data & analytics 7.50% | Real-time air quality monitoring 4.73% |
| Data & central control centers 5.90% | Real-time water network monitoring 5.69% | Real-time water quality monitoring 4.33% |
| Communication systems 5.37% | Smart grids/smart meters 5.17% | Data to optimize waste collection 3.33% |

Key partnerships in 3 years

| Key partnerships in 3 years | Top domain investments in 3 years |
|-------------------------------|--------------------------------------|
| Multilaterals 58% | Environment 37% |
| Federal government 58% | Mobility & transportation 28% |
| Regional agencies 53% | Energy; economy 26% |

Top SDG funding now

| Top SDG funding now | Top SDG funding In 3 years |
|-------------------------------------|-------------------------------------|
| Government based 89% | Government based 79% |
| Public funding & grants 79% | Private-sector financing 58% |
| Private-sector financing 58% | Multilateral 58% |

Top SDG challenges next 3 years

53%

Weak economy/high unemployment

47%

High costs & budgetary constraints

37%

High cost of digital connectivity

37%

Fast pace of technological change

37%

Complex policies & regulations

Africa Smart scorecard

With their more limited resources, cities in Africa invest less than others across all technologies and solutions. They have the second smallest average technology budget (after Latin American cities)—just \$5.6m annually. Interestingly, as they boost their investments over the next three years, they hope to modestly overtake cities in Asia.

Despite small digital budgets, African cities are making large investments in a few technologies, notably mobile, biometrics, IoT, and cloud. No African city reports making big outlays in the more rarefied technologies such as drones, augmented reality, digital twins, and 3-D printing.

Africa is the only region with no city that is well prepared for cyberattacks, and it trails all others in plans to invest in cybersecurity over the next three years. Furthermore, African cities are the least advanced in using data, and are the furthest behind in using digital solutions and other practices to engage their citizens.

Under our smart city maturity framework, 13 African cities are in the beginner stage, while six are intermediates. None is a leader.

| Biggest investments now | | Biggest increase over next 3 years | |
|-------------------------|-----|------------------------------------|------|
| Mobile, apps | 95% | Digital platforms | +42% |
| Biometrics | 74% | Digital dashboards | +37% |
| IoT | 68% | Data warehouses, lakes | +32% |
| Cloud | 68% | Blockchain | +31% |
| Telematics; RPA; and AI | 47% | Drones, robots | +21% |

Average annual tech budget



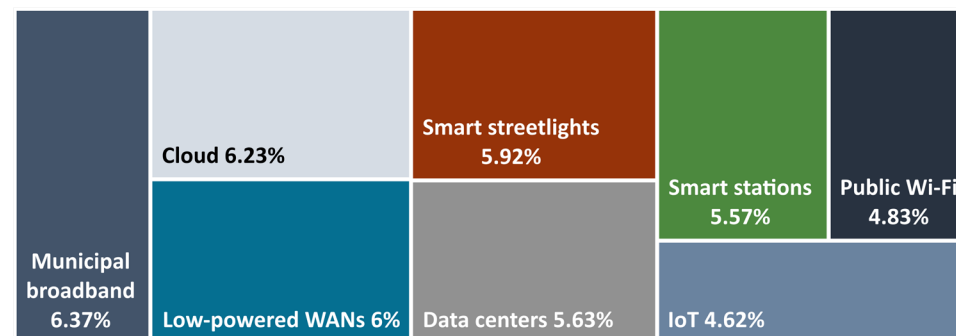
Large city: \$14.6m



Small city: \$0.9m

Average \$5.6m

Average ROI on digital infrastructure investments



| Data most used now | | Biggest rise in data in 3 years | |
|----------------------|-----|---------------------------------|------|
| Citizen satisfaction | 58% | Predictive | +42% |
| Administrative | 58% | Behavioral | +26% |
| IoT | 53% | Channel usage | +21% |
| Business | 47% | Real-time | +21% |
| Citizen usage data | 42% | Supply chain | +6% |

| Africa behind in engaging citizens | All cities | Africa | Diff. |
|---|------------|--------|-------|
| Using digital communication | 72% | 37% | -35% |
| Using gamification | 46% | 21% | -25% |
| Appointing Chief Citizen Experience Officer | 12% | 0% | -12% |
| Having citizens help set goals | 49% | 37% | -12% |
| Personalizing digital platforms | 53% | 62% | -9% |

Africa City indicators

| City | SDG in plans | SDG progress | Tracks SDGs | SDG department | Smart city maturity |
|---------------|--------------|-----------------|-------------|----------------|---------------------|
| Accra | Yes | Sprinter | Yes | Yes | Intermediate |
| Addis Ababa | Yes | Advancer | Yes | Yes | Intermediate |
| Bamako | No | Implementer | No | No | Beginner |
| Benin City | No | Implementer | No | No | Beginner |
| Blantyre | Yes | Implementer | No | No | Beginner |
| Cotonou | Yes | Implementer | No | No | Beginner |
| Dar es Salaam | No | Implementer | No | No | Beginner |
| Ekurhuleni | Yes | Advancer | Yes | Yes | Intermediate |
| Harare | No | Implementer | No | No | Intermediate |
| Ibadan | No | Implementer | No | No | Beginner |
| Kampala | Yes | Implementer | No | No | Beginner |
| Kano | Yes | Implementer | Yes | No | Intermediate |
| Kigali | Yes | Advancer | No | No | Beginner |
| Kinshasa | Yes | Implementer | No | No | Intermediate |
| Lagos | No | Implementer | No | No | Beginner |
| Libreville | No | Implementer | No | No | Beginner |
| Lusaka | No | Implementer | No | No | Beginner |
| Monrovia | Yes | Implementer | No | No | Beginner |
| Touba | Yes | Advancer | Yes | No | Beginner |

Cities 4.0 are highlighted in gray



Asia Pacific SDG scorecard

Cities in APAC are behind those in other regions in advancing their SDG agendas. Just 50% have incorporated the SDG framework into their plans, and only 58% have made considerable headway on the SDGs. In comparison, 90% or more of cities in other regions, except Africa, have adopted the SDGs.

Still, APAC cities have forged ahead in some key areas. An admirable 96% have made significant progress on eliminating poverty, while around three-quarters have made good progress on quality education, and meeting work and economic growth goals. However, gender inequality remains a major challenge, underscored by the region's relatively high levels of domestic violence, unsafe work, and judicial discrimination.

Within our SDG progress framework, five Asian cities—Mumbai, Osaka, Singapore, Suzhou, and Tokyo—qualify as sprinters. Fifteen are early-stage implementers and 27 are advancers.

Most progress on SDGs



No poverty

96%



Quality education

72%



Decent work & economic growth

74%

Least progress on SDGs



Gender equality

33%



Peace & justice

35%



Partnerships for the goals

38%

Average ROI

| Safety & security | Energy & water | Environment |
|---|--|---|
| Data-sharing systems for agencies 6.70% | Apps to track energy use 5.60% | Real-time air quality monitoring 4.94% |
| Data-driven policing 6.50% | Apps to track water usage 5.58% | Real-time water quality monitoring 4.85% |
| Central control centers gathering data 5.77% | Smart water meters 5.56% | Data to optimize water collection routes 3.33% |

Key partnerships in 3 years

| Key partnerships in 3 years | | Top domain investments in 3 years | |
|-----------------------------|------------|-----------------------------------|------------|
| Federal government | 59% | Living & health | 57% |
| Regional agencies | 54% | Mobility & transportation | 54% |
| Consultants, outsourcing | 50% | Digital infrastructure | 54% |

Top SDG funding now

| Top SDG funding now | | Top SDG funding In 3 years | |
|--------------------------|------------|----------------------------|------------|
| Private-sector financing | 89% | Private-sector financing | 61% |
| Government based | 76% | Government based | 59% |
| Public funding & grants | 59% | Multilateral, development | 52% |

Top SDG challenges next 3 years

52%

Finding right partners, suppliers

41%

Data security & privacy

39%

Fast pace of digital change

30%

Complex policies & regulations

28%

Coordinating across departments

Asia Pacific Smart scorecard

APAC cities are behind those in North America and Europe in their smart innovation investments. They have a far smaller average budget for smart technologies (\$16.3m) than North American cities (\$33.2m) and European cities (\$29.8m).

Currently, APAC cities spend the most on cloud, IoT, AI, mobile, and digital platforms. Over the next three years, they will make bigger investments in other specialized solutions, such as blockchain, drones, and data warehouses. Given the leadership role of Japan, South Korea, and China in additive manufacturing, it is no wonder that cities there are making larger investments in 3D printing than in other regions.

Asian cities also lag their North American and European counterparts in their readiness for cyberattacks, with just 38% reporting they are well or very prepared. Yet they are aware of the need to catch up: more APAC cities plan to make large outlays in cybersecurity over the next three years than cities in any other region.

Three cities—Auckland, Seoul, and Singapore—are designated as smart city leaders, 23 as intermediates, and 24 as beginners. Singapore stands out as a City 4.0: one that leads in both the SDGs and in smart technology.

| Biggest investments now | | Biggest increase over next 3 years | |
|-------------------------|-----|------------------------------------|------|
| Cloud | 74% | Blockchain | +24% |
| IoT | 72% | Drones, other | +20% |
| AI | 67% | Data warehouses, lakes | +13% |
| Mobile, apps | 65% | Digital dashboards | +13% |
| Digital platform | 54% | Telematics | +11% |

Average annual tech budget



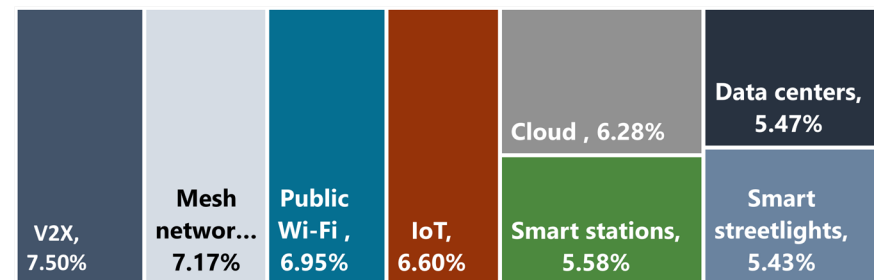
Large city: \$27.7m



Small city: \$11.6m

Average: \$16.3m

Average ROI on digital infrastructure investments



| Data most used now | | Biggest rise in data in 3 years | |
|----------------------|-----|---------------------------------|------|
| Administrative | 83% | Predictive | +28% |
| Citizen satisfaction | 59% | Behavioral | +20% |
| IoT | 57% | Peer-based | +17% |
| Citizen usage | 54% | Geospatial | +11% |
| Real-time | 52% | IoT | +8% |

| APAC lags in citizen engagement | All cities | APAC | Diff. |
|---------------------------------|------------|------|-------|
| Personalizing digital platforms | 52% | 62% | -10% |
| Involving disadvantaged | 49% | 39% | -10% |
| Having citizens help set goals | 49% | 39% | -10% |
| Demonstrating value | 47% | 37% | -10% |
| Using gamification | 46% | 39% | -7% |

Asia Pacific City indicators

| City | SDG in plans | SDG progress | Tracks SDGs | SDG department | Smart city maturity |
|-------------|--------------|--------------|-------------|----------------|---------------------|
| Adelaide | Yes | Advancer | Yes | Yes | Intermediate |
| Ahmedabad | Yes | Advancer | Yes | Yes | Beginner |
| Auckland | Yes | Advancer | Yes | Yes | Leader |
| Bangkok | Yes | Advancer | Yes | No | Beginner |
| Beijing | No | Advancer | Yes | No | Intermediate |
| Busan-Ulsan | Yes | Advancer | Yes | Yes | Intermediate |
| Canberra | Yes | Advancer | Yes | No | Intermediate |
| Changchun | No | Implementer | No | No | Beginner |
| Chengdu | No | Advancer | No | Yes | Intermediate |
| Chennai | Yes | Advancer | Yes | No | Intermediate |
| Chongqing | No | Implementer | No | No | Beginner |
| Dalian | No | Implementer | No | No | Beginner |
| Dehradun | Yes | Advancer | Yes | No | Beginner |
| Fukuoka | Yes | Advancer | Yes | Yes | Intermediate |
| Guiyang | No | Implementer | No | No | Intermediate |
| Hangzhou | No | Advancer | No | No | Beginner |
| Hanoi | Yes | Advancer | Yes | Yes | Intermediate |
| Hefei | No | Implementer | No | No | Intermediate |
| Jaipur | No | Implementer | No | No | Beginner |
| Jakarta | Yes | Advancer | No | No | Intermediate |
| Jiaozuo | No | Implementer | No | No | Intermediate |
| Jinan | No | Implementer | No | No | Beginner |
| Kochi | Yes | Implementer | Yes | No | Beginner |

Cities 4.0 are highlighted in gray

| City | SDG in plans | SDG progress | Tracks SDGs | SDG department | Smart city maturity |
|------------------|--------------|-----------------|-------------|----------------|---------------------|
| Kuala Lumpur | Yes | Advancer | No | No | Intermediate |
| Lahore | No | Implementer | No | No | Beginner |
| Lucknow | Yes | Advancer | Yes | Yes | Intermediate |
| Ludhiana | No | Advancer | No | No | Intermediate |
| Manila | No | Advancer | No | No | Intermediate |
| Mumbai | Yes | Sprinter | Yes | Yes | Intermediate |
| Nanjing | No | Advancer | No | No | Intermediate |
| Ningbo | No | Advancer | No | No | Beginner |
| Osaka | Yes | Sprinter | Yes | Yes | Intermediate |
| Phnom Penh | Yes | Advancer | No | No | Beginner |
| Pune | No | Implementer | No | No | Intermediate |
| Qingdao | No | Implementer | No | No | Beginner |
| Quezon City | Yes | Advancer | Yes | No | Beginner |
| Seoul | Yes | Advancer | Yes | Yes | Leader |
| Shanghai | No | Advancer | Yes | No | Intermediate |
| Singapore | Yes | Sprinter | Yes | Yes | Leader |
| Suzhou | No | Sprinter | Yes | Yes | Intermediate |
| Tianjin | No | Implementer | No | No | Beginner |
| Tokyo | Yes | Sprinter | Yes | No | Intermediate |
| Toyama | Yes | Implementer | Yes | No | Beginner |
| Wuhan | No | Advancer | No | No | Beginner |
| Xiamen | No | Advancer | Yes | No | Beginner |
| Yangon | Yes | Implementer | No | No | Beginner |



Europe SDG scorecard

European cities have made the most progress on achieving the SDGs of any region, with 77% of cities on average having advanced considerably on their goals. Ninety-two percent have incorporated the SDG into their plans.

European cities have made the most impressive gains in the SDGs centered on health and well-being, decent work and economic growth, and sustainable cities and communities. Even in areas where they have made the least progress, such as reduced inequalities and climate action, they are ahead of cities in other regions. It is especially noteworthy how far ahead they are of North American cities on climate action, which are at the very bottom of the pack.

Europe boasts the largest number of sprinter cities in the survey, with 16, double the number in North America. Another 19 cities are advancers. Reflecting the regional commitment to the SDGs, only one European city, Jena, is classified as an implementer, in the earliest stage of SDG development.

Most progress on SDGs



Health & well-being

95%



Decent work & economic growth

92%



Sustainable cities

86%

Least progress on SDGs



Life below water

49%



Climate action

65%



Reduced inequalities

68%

Average ROI

| Safety & security | Energy & water | Environment |
|--|-----------------------------------|---|
| Data-driven policing 6.70% | Smart water meters 6.81% | Data to optimize waste collection 6.53% |
| Facial recognition & biometrics 6.61% | Smart grids/smart meters 6.02% | Real-time air quality monitoring 5.87% |
| Early warning systems & digital twins 6.53% | Apps to track energy use 5.51% | Real-time water quality monitoring 5.57% |

Key partnerships in 3 years

| | | | |
|-----------------------------|-----|------------------------|-----|
| Federal government | 70% | Digital infrastructure | 78% |
| Regional agencies | 65% | Living & health | 76% |
| State/provincial government | 59% | Environment | 76% |

Top SDG funding now

| | | | |
|--------------------------|-----|--------------------------|-----|
| Private-sector financing | 94% | Private-sector financing | 86% |
| Government based | 94% | Government based | 77% |
| Public funding & grants | 57% | Crowdfunding from public | 77% |

Top domain investments in 3 years

Top SDG challenges next 3 years

62%

Complex policies & regulations

49%

Finding right suppliers, partners

49%

Data security & privacy

43%

Need to focus on basic services

35%

Coordinating across city departments

Europe Smart scorecard

European cities have the second-largest average technology budgets (after their North American counterparts), at \$29.8m. Every European municipality has made a large investment in the cloud, and over 90% have done so in mobile, biometrics, and IoT. Over the next three years, European cities will increase investments most in digital twins, AI, data warehouses, and online collaborative tools.

Cities in Europe are also second to those in North America in preparedness for cyberattacks: 54% are well or very well prepared (vs. 58% of North American cities). With a continued eye on cyber threats, they will boost cybersecurity spending only slightly less than North American cities over the next three years.

Europe has the highest number of smart city leaders in our study, with 18. It has 13 intermediate cities and six beginners. Thirteen also qualify as Cities 4.0, ahead in both SDG progress and smart innovation. Reflecting the digital sophistication of European cities, they are also posting the highest average ROI on their technology investments to achieve the SDGs.

| Biggest investments now | | Biggest increase over next 3 years | |
|-------------------------|-------------|------------------------------------|-------------|
| Cloud | 100% | Digital twins | +38% |
| Mobile, apps | 97% | AI | +29% |
| Biometrics | 97% | Data warehouse, lakes | +19% |
| IoT | 95% | Online collaborative tools | +16% |
| Blockchain | 81% | AR/VR | +14% |

Average annual tech budget



Large city: \$40.5m



Small city: \$18.6m

Average: \$29.8 m

Average ROI on digital infrastructure investments

| | | | |
|------------------------------|----------------------------|--------------------------------|------------------------|
| Smart stations, 6.71% | Public Wi-Fi, 6.58% | Municipal broadband , 6.32% | IoT, 5.87% |
| Smart streetlights, 6.65% | Cloud technology, 6.53% | Mesh networks, 6.00% | Data centers, 5.17% |

| Data most used now | | Biggest rise in data in 3 years | |
|----------------------|------------|---------------------------------|-------------|
| IoT | 95% | Channel usage | +40% |
| Citizen usage | 81% | Predictive | +35% |
| Administrative | 78% | Business | +24% |
| Citizen satisfaction | 59% | Peer-based | +22% |
| Real-time | 59% | Crowd-sourced | +22% |

| Europe is ahead in engaging citizens | All cities | Europe | Diff. |
|--------------------------------------|------------|--------|-------|
| Personalizing digital platforms | 62% | 81% | 19% |
| Using gamification | 46% | 59% | 13% |
| Using digital communications | 72% | 84% | 12% |
| Demonstrating value | 47% | 57% | 10% |
| Involving disadvantaged | 49% | 59% | 10% |

Europe City indicators

| City | SDG in plans | SDG progress | Tracks SDGs | SDG department | Smart City maturity |
|------------|--------------|-----------------|-------------|----------------|---------------------|
| Aarhus | Yes | Sprinter | Yes | Yes | Leader |
| Almaty | No | Advancer | No | No | Beginner |
| Amsterdam | Yes | Advancer | Yes | Yes | Leader |
| Athens | Yes | Sprinter | Yes | Yes | Leader |
| Barcelona | Yes | Sprinter | Yes | Yes | Leader |
| Belgrade | Yes | Advancer | Yes | Yes | Intermediate |
| Berlin | Yes | Sprinter | Yes | Yes | Leader |
| Birmingham | Yes | Sprinter | Yes | Yes | Leader |
| Bratislava | Yes | Sprinter | Yes | Yes | Intermediate |
| Bucharest | Yes | Advancer | Yes | Yes | Intermediate |
| Copenhagen | Yes | Sprinter | Yes | Yes | Leader |
| Dublin | Yes | Advancer | Yes | Yes | Leader |
| Galway | Yes | Advancer | Yes | No | Beginner |
| Helsinki | Yes | Sprinter | No | No | Leader |
| Istanbul | Yes | Advancer | Yes | Yes | Leader |
| Jena | No | Implementer | No | No | Beginner |
| Kyiv | Yes | Sprinter | Yes | Yes | Intermediate |
| Liege | Yes | Advancer | Yes | Yes | Beginner |
| Lisbon | Yes | Advancer | Yes | No | Intermediate |

Cities 4.0 are highlighted in gray

| City | SDG in plans | SDG progress | Tracks SDGs | SDG department | Smart City maturity |
|---------------|--------------|-----------------|-------------|----------------|---------------------|
| Ljubljana | Yes | Advancer | Yes | Yes | Intermediate |
| London | Yes | Sprinter | Yes | Yes | Leader |
| Madrid | Yes | Sprinter | Yes | No | Leader |
| Mariupol | No | Advancer | No | No | Beginner |
| Moscow | Yes | Sprinter | Yes | No | Leader |
| Munich | Yes | Advancer | Yes | No | Intermediate |
| Oslo | Yes | Advancer | Yes | Yes | Intermediate |
| Paris | Yes | Sprinter | Yes | Yes | Leader |
| Porto | Yes | Advancer | Yes | Yes | Intermediate |
| Prague | Yes | Advancer | Yes | Yes | Leader |
| Reykjavik | Yes | Advancer | Yes | Yes | Intermediate |
| Rotterdam | Yes | Advancer | Yes | Yes | Leader |
| St Petersburg | Yes | Advancer | Yes | No | Intermediate |
| Stockholm | Yes | Sprinter | Yes | Yes | Intermediate |
| Tallinn | Yes | Sprinter | Yes | Yes | Leader |
| Tbilisi | Yes | Advancer | Yes | Yes | Beginner |
| Vienna | Yes | Sprinter | Yes | Yes | Leader |
| Warsaw | Yes | Advancer | Yes | Yes | Intermediate |



Latin America SDG scorecard

After Africa, Latin America has advanced the least in achieving the SDGs: only 47% of cities on average report having made considerable progress across the 17 goals. But 93% of cities have built the SDG framework into their plans, showing their commitment.

Latin American cities have made the most progress in reducing poverty, a product of social welfare policies adopted by governments around the region to address this chronic problem. After poverty alleviation, they have made the most headway on sustainable cities, responsible consumption, and gender equality.

With five sprinter cities, Latin America has more than Africa or MENA. Only one Latin American city surveyed (San Juan) is in the earliest, implementer stage of SDG development.

Average ROI

| Safety & security | Energy & water | Environment |
|--|--|---|
| Crowdsourced crime reporting apps 7.10% | Smart grids/smart meters 7.05% | Real-time water quality monitoring 6.94% |
| Drones & aerial surveillance 6.21% | Apps to track energy use 6.46% | Real-time air quality monitoring 6.39% |
| Facial recognition & biometrics 6.11% | Microgrids/distributed generation 5.87% | Predictive analytics for flood warning 3.50% |

Top SDG challenges next 3 years

53%

Finding right partner or supplier

53%

Complex policies & regulations

47%

Data security & privacy risks

40%

Inadequate infrastructure

40%

Fast pace of technological change

Most progress on SDGs



No poverty

87%



Sustainable cities

60%



Responsible consumption; gender equality

60%

Least progress on SDGs



Reduced inequalities

20%



Industry, innovation

27%



Life on land; peace/justice institutions

27%

Key partnerships in 3 years

| | |
|-----------------------------|------------|
| Regional agencies | 93% |
| Federal government | 87% |
| State/provincial government | 80% |

Top domain investments in 3 years

| | |
|---------------------------------|------------|
| Living & health | 60% |
| Environment & sustainability | 87% |
| Public safety; mobility; energy | 80% |

Top SDG funding now

| | |
|--------------------------|------------|
| Private-sector financing | 93% |
| Public funding & grants | 80% |
| Government based | 80% |

Top SDG funding in 3 years

| | |
|--------------------------|------------|
| Private-sector financing | 73% |
| Government based | 73% |
| Crowdfunding from public | 67% |

Latin America Smart scorecard

Cities in Latin America have the lowest average annual technology budget of any region, at just \$5.4m. However, they invest heavily into three key technologies: cloud, mobile, and IoT. All other technologies are used far less. Over the next three years, Latin American cities intend to boost investments substantially.

Latin American cities are not focusing sufficiently on cybersecurity threats: they lag those in all regions except Africa in their preparedness for cyberattacks, with just 13% saying they are well prepared. They will stay near the bottom of the list in terms of cybersecurity investments planned for the next three years. Of note, Latin American cities make strong use of certain types of data to support their operations, especially administrative, citizen usage, and IoT data.

Of the Latin American cities surveyed, five are beginners in smart city maturity, while 10 are intermediates. None is a leader. Bogota, however, is an example of a city that is making solid progress on several fronts, including in investing in smart solutions such as data management systems to address transport and mobility problems—particularly helpful in a city ranked as one of the world's worst in traffic congestion.

| Biggest investments now | | Biggest increase over next 3 years | |
|---------------------------------|------|--|------|
| Cloud | 100% | AI | +40% |
| Mobile, apps | 93% | Biometrics | +26% |
| IoT | 80% | Drones/robots | +26% |
| Biometrics | 47% | IoT; data warehouses, lakes | +20% |
| Blockchain; AI; data management | 40% | Telematics; online collaborative tools | +20% |

Average annual tech budget



Large city: \$7m



Small city: \$2.5m

Average \$5.4 m

Average ROI on digital infrastructure investments

| | | | |
|----------------------|-------------------------|---------------------------|----------------------------|
| Smart beacons, 7.50% | Public Wi-Fi, 7.23% | Smart streetlights, 6.21% | Smart stations, 5.25% |
| Mesh networks, 7.50% | Cloud technology, 6.60% | IoT, 5.83% | Municipal broadband, 5.25% |

| Data most used now | | Biggest rise in data in 3 years | |
|--------------------|------|---------------------------------|------|
| Administrative | 100% | Crowd-sourced | +33% |
| Citizen usage data | 67% | Real-time | +33% |
| IoT | 60% | Business | +27% |
| Behavioral | 53% | Peer-based | +20% |
| Crowd-sourced | 47% | Geospatial; predictive | +20% |

| LATAM behind in engaging citizens | All cities | LATAM | Diff. |
|---|------------|-------|-------|
| Using digital communication | 72% | 53% | -19% |
| Personalizing digital platforms | 62% | 47% | -15% |
| Appointing Chief Citizen Experience Officer | 12% | 0% | -12% |
| Involving disadvantaged | 49% | 40% | -9% |
| Having citizens help set goals | 49% | 47% | -2% |

Latin America City indicators

| City | SDG in plans | SDG progress | Tracks SDGs | SDG department | Smart City maturity |
|-------------------|--------------|-----------------|-------------|----------------|---------------------|
| Asuncion | Yes | Advancer | Yes | No | Intermediate |
| Bogota | Yes | Sprinter | Yes | Yes | Intermediate |
| Buenos Aires | Yes | Sprinter | No | No | Intermediate |
| Colima | Yes | Advancer | Yes | No | Beginner |
| Lima | Yes | Advancer | Yes | Yes | Beginner |
| Mexico City | Yes | Sprinter | Yes | No | Beginner |
| Monterrey | Yes | Advancer | No | No | Intermediate |
| Montevideo | Yes | Sprinter | Yes | No | Intermediate |
| Panama City | Yes | Advancer | Yes | No | Intermediate |
| Quito | Yes | Advancer | Yes | No | Intermediate |
| Rio de Janeiro | Yes | Advancer | Yes | No | Intermediate |
| San Jose | Yes | Advancer | Yes | Yes | Beginner |
| San Juan | No | Implementer | No | No | Beginner |
| Santiago de Chile | Yes | Advancer | Yes | Yes | Intermediate |
| Sao Paulo | Yes | Sprinter | Yes | Yes | Intermediate |



MENA SDG scorecard

Cities in MENA have made huge strides in achieving their goals, with 63% having made good progress—trailing only Europe and North America. And 90% have incorporated the SDGs into their plans. Even more impressive, MENA cities have made these achievements while operating in a region where policies and regulations can lack uniformity and local top-tier providers can be hard to find.

All MENA cities surveyed report having made considerable progress in poverty alleviation—no other region has reported such widespread progress on any of the SDGs. At the same time, cities in MENA report the lowest share (10%) in reducing inequality, a major trouble spot in the region where extreme income inequality is leading to polarization and destabilization.

Of the 10 MENA cities in the survey, eight are classified as advancers, one as an early implementer (Cairo), and one as a sprinter (Amman).

Most progress on SDGs



No poverty

100%



Partnerships for the goals

90%



Affordable & clean energy

90%

Least progress on SDGs



Reduced inequalities

10%



Peace & justice institutions

40%



Responsible consumption

40%

Average ROI

| Safety & security | Energy & water | Environment |
|---|--|---|
| Crowdsourced crime reporting 8.75% | Smart water meters 6.78% | Predictive analytics for flood warning 7.50% |
| In-car/body cameras for police 8.00% | Microgrids/distributed generation 6.00% | Real-time air quality monitoring 5.70% |
| Smart ground surveillance 5.25% | Smart grids/smart meters 5.22% | Use of data to optimize waste collection 4.88% |

Key partnerships in 3 years

| Key partnerships in 3 years | Top domain investments in 3 years |
|---|---|
| Multilateral organizations 70% | Energy, water; economy 70% |
| Federal government 70% | Public safety; living & health 60% |
| Consultants, outsourcing; corporations 60% | Digital infrastructure 60% |

Top SDG funding now

| Top SDG funding now | Top SDG funding in 3 years |
|--------------------------------------|--|
| Private-sector financing 100% | Government based 90% |
| Public funding & grants 80% | Private-sector financing 70% |
| Government based 80% | Vendor financing; philanthropic 60% |

Top challenges to SDGs next 3 years

80%

Complex policies & regulations

60%

Finding right suppliers, partners

50%

Pace of digital change

40%

Unclear implementation roadmap

40%

Data security & privacy risks

MENA Smart scorecard

Cities in MENA are advancing steadily in smart city innovation. They are making large investments in several digital technologies and will increase those outlays over the next three years. Yet their average annual technology budget, at \$12.9m at present, lags that of North America and Europe substantially.

Cities in this region invest the most in cloud, IoT, biometrics, and mobile. Over the next three years, they will boost their spending on more sophisticated technologies such as online collaborative tools, data warehouses, digital twins, AI, blockchain, edge computing, and AR/VR. Cities in MENA are heavier users of biometrics and crowd-sourced data than those in any other regions.

Forty percent of cities in MENA say they are well or very well prepared for cybersecurity threats, placing them behind only North American and European cities. Although they plan to boost cybersecurity investments, they will continue to lag those regions in outlays over the next three years.

Eight of the MENA cities in the study are intermediate in smart city maturity, while one, Abu Dhabi, is a leader, and one, Tunis, is a beginner. Abu Dhabi's status reflects the Emirate's high-profile strategy to make its capital city the leading technology and innovation hub in the Middle East.

| Biggest investments now | | Biggest increase over next 3 years | |
|-----------------------------|------|------------------------------------|------|
| Cloud | 100% | Online collaborative tools | +50% |
| IoT | 90% | Data warehouses, lakes | +30% |
| Biometrics | 90% | Digital twins | +30% |
| Mobile, apps | 80% | AI; blockchain | +20% |
| RPA; digital dashboards; AI | 70% | Edge computing; AR/VR | +20% |

Average annual tech budget



Large city: \$13.1m



Small city: \$17.6m

Average \$12.9 m

Average ROI on digital infrastructure investments

| | | | | |
|--------------------------------|-------------------------------|---------------|--------------------------|-----------------------------|
| Municipal broadband , 7.50% | Public Wi-Fi , 6.85% | IoT , 6.28% | Smart beacons , 5.25% | Low-powered WANs , 5.25% |
| Mesh networks , 7.50% | Smart streetlights , 6.37% | Cloud , 5.95% | Data centers , 5.25% | |

Data most used now

Biggest rise in data in 3 years

| | | | |
|--------------------------|-----|----------------------|------|
| IoT | 80% | Predictive | +50% |
| Biometric | 80% | Behavioral | +40% |
| Administrative | 80% | Geospatial | +30% |
| Real-time; citizen usage | 50% | Citizen satisfaction | +30% |
| Crowd-sourced | 50% | Real-time | +30% |

MENA behind in engaging citizens

| | All cities | MENA | Diff. |
|---|------------|------|-------|
| Personalizing digital platforms | 62% | 50% | -12% |
| Appointing Chief Citizen Experience Officer | 12% | 0% | -12% |
| Encouraging use of digital tools | 31% | 20% | -11% |
| Involving the disadvantaged | 40% | 49% | -9% |
| Demonstrating value | 40% | 47% | -7% |

MENA City indicators

| City | SDG in plans | SDG progress | Tracks SDGs | SDG department | Smart City maturity |
|-------------|--------------|-----------------|-------------|----------------|---------------------|
| Abu Dhabi | Yes | Advancer | No | No | Leader |
| Amman | Yes | Sprinter | Yes | Yes | Intermediate |
| Cairo | Yes | Implementer | Yes | No | Intermediate |
| Doha | Yes | Advancer | Yes | Yes | Intermediate |
| Jerusalem | Yes | Advancer | Yes | No | Intermediate |
| Kuwait City | Yes | Advancer | Yes | Yes | Intermediate |
| Manama | No | Advancer | No | No | Intermediate |
| Rabat | Yes | Advancer | Yes | Yes | Intermediate |
| Riyadh | Yes | Advancer | Yes | Yes | Intermediate |
| Tunis | Yes | Advancer | No | No | Beginner |



North America SDG scorecard

North American cities lead the way in adopting the SDGs, with 95% having incorporated them into their plans. They rank only behind European cities in their progress across the SDGs (71% on average vs. 77% in Europe).

Cities in North America have made the most headway on industry and innovation, sustainable cities, health and well-being, decent work and economic growth, and life on land—areas in which 85%-90% have made considerable progress. Yet cities in North America have made the least progress of any cities globally on climate action.

Most North American cities surveyed, 30, qualify as advancers in SDG development; only two (Allentown and Pearland) are early implementers. Eight are sprinters—those that have made the most progress.

Average ROI

| Safety & security | Energy & water | Environment |
|---|--|--|
| Communications systems 6.85% | Smart grids/smart meters 6.56% | Real-time air quality monitoring 6.12% |
| Facial recognition & biometrics 6.81% | Smart water meters 6.09% | Real-time water quality monitoring 5.36% |
| Smart ground surveillance 6.74% | Apps to track energy use 5.82% | Data to optimize waste collection 4.95% |

Top SDG challenges next 3 years

68%

Complex policies & regulations

60%

Data security & privacy

58%

Finding right suppliers or partner

43%

Fast pace of technological change

38%

Need to focus on basic services

Most progress on SDGs



Industry, innovation

90%



Sustainable cities; health & well-being

85%



Decent work & economic growth; life on land

85%

Least progress on SDGs



Climate action

10%



Partnerships for the goals

45%



Reduced inequities

53%

Key partnerships in 3 years

| | | | |
|-----------------------------|------------|---------------------------------------|------------|
| Federal government | 80% | Economy, trade, industry | 75% |
| State/provincial government | 75% | Mobility & transport; living & health | 73% |
| Multilaterals | 73% | Public safety | 68% |

Top domain investments in 3 years

Top SDG funding now

| | | | |
|--------------------------|------------|--------------------------|------------|
| Government based | 90% | Crowdfunding from public | 83% |
| Private-sector financing | 83% | Government based | 78% |
| User fees/taxes | 68% | Private-sector financing | 70% |

Top SDG funding In 3 years

North America Smart scorecard

With the largest average technology budget of any region, at \$33.2m, it is no wonder that North American cities are the most digitally advanced in the world. They make the largest technology investments overall, with more than 90% of cities reporting big outlays in IoT, mobile, and cloud, and only slightly less in AI. They will continue to be leaders in digital investment over the next three years, although cities in Europe and MENA will start to catch up.

Given their digital sophistication, North American cities are the most ahead in readiness for cyberattacks (with 58% well or very well prepared). However, more Asian than North American cities plan large investments in cybersecurity over the next three years.

Fifteen North American cities in our survey qualify as smart innovation leaders, while 21 are intermediates. Four are beginners. Six are classified as Cities 4.0: Baltimore, Boston, Los Angeles, New York, Orlando, and Philadelphia. These have distinguished themselves by being far ahead on both the SDGs and smart innovation.

Orlando is one city that sets an example for others: it follows best practices such as building partnerships with universities and non-profits, collaborating with neighboring cities, tracking progress via voluntary local reviews, addressing the digital divide, and using data to assess its citizens' needs.

| Biggest investments now | | Biggest increase over next 3 years | |
|-------------------------|-----|------------------------------------|------|
| IoT | 98% | Digital twins | +32% |
| Mobile, apps | 95% | Data warehouses, lakes | +25% |
| Cloud | 95% | Telematics | +18% |
| Biometrics | 88% | Blockchain | +15% |
| AI | 83% | Digital dashboards | +10% |

Average annual tech budget



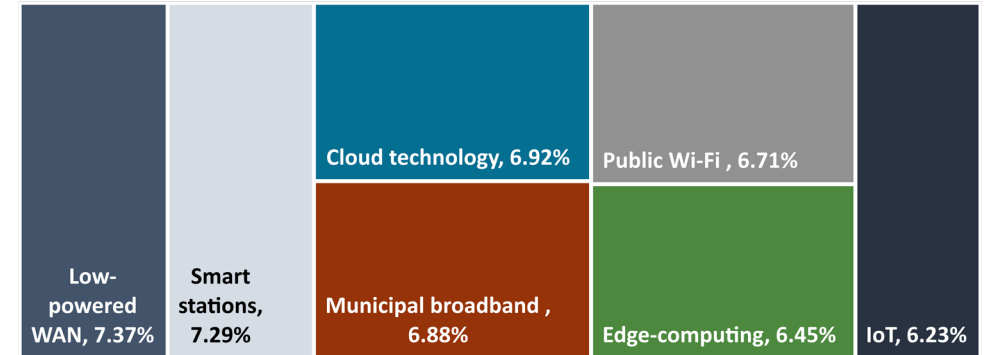
Large city: \$142m



Small city: \$26.9m

Average: \$33.2m

Average ROI on digital infrastructure investments



| Data most used now | | Biggest rise in data in 3 years | |
|----------------------|-----|---------------------------------|------|
| IoT | 85% | Predictive | +30% |
| Administrative | 75% | Channel usage | +25% |
| Behavioral | 68% | Real-time | +25% |
| Citizen satisfaction | 58% | Crowd-sourced; business | +22% |
| Citizen usage | 58% | Peer-based | +20% |

| North America ahead in engaging citizens | All cities | N Amer | Diff. |
|---|------------|--------|-------|
| Encouraging use of digital tools | 31% | 43% | 12% |
| Appointing Chief Citizen Experience Officer | 12% | 23% | 11% |
| Involving disadvantaged | 49% | 58% | 9% |
| Having citizens help set goals | 49% | 58% | 9% |
| Using digital communications | 72% | 80% | 8% |

North America City indicators

| City | SDGs in plans | SDGs progress | SDGs monitoring | SDGs department | Smart maturity |
|--------------------|---------------|-----------------|-----------------|-----------------|----------------|
| Allentown | No | Implementer | No | No | Beginner |
| Atlanta | Yes | Advancer | Yes | No | Leader |
| Austin | Yes | Advancer | Yes | No | Intermediate |
| Baltimore | Yes | Sprinter | Yes | Yes | Leader |
| Boston | Yes | Sprinter | Yes | Yes | Leader |
| Brantford | Yes | Advancer | Yes | No | Beginner |
| Calgary | Yes | Advancer | Yes | Yes | Intermediate |
| Chicago | Yes | Advancer | Yes | Yes | Leader |
| Cincinnati | Yes | Advancer | Yes | Yes | Intermediate |
| Columbus | Yes | Advancer | Yes | No | Leader |
| Denver | Yes | Advancer | Yes | No | Intermediate |
| Detroit | Yes | Advancer | Yes | No | Leader |
| Edmonton | Yes | Advancer | No | Yes | Intermediate |
| El Paso | Yes | Advancer | Yes | Yes | Intermediate |
| Honolulu | Yes | Advancer | Yes | Yes | Intermediate |
| Kansas City | Yes | Advancer | Yes | No | Intermediate |
| Los Angeles | Yes | Sprinter | Yes | Yes | Leader |
| Manchester | Yes | Advancer | Yes | No | Beginner |
| Montreal | Yes | Advancer | Yes | No | Leader |
| Nashville | Yes | Advancer | Yes | No | Intermediate |

Cities 4.0 are highlighted in gray

| City | SDGs in plans | SDGs progress | SDGs monitoring | SDGs department | Smart maturity |
|---------------------|---------------|-----------------|-----------------|-----------------|----------------|
| New York | Yes | Sprinter | Yes | Yes | Leader |
| Newark | Yes | Advancer | Yes | No | Intermediate |
| Oakland | Yes | Advancer | Yes | Yes | Intermediate |
| Orlando | Yes | Sprinter | Yes | Yes | Leader |
| Pearland | No | Implementer | No | No | Beginner |
| Philadelphia | Yes | Sprinter | Yes | Yes | Leader |
| Phoenix | Yes | Advancer | Yes | Yes | Intermediate |
| Pittsburgh | Yes | Sprinter | Yes | No | Intermediate |
| Portland | Yes | Advancer | Yes | Yes | Intermediate |
| Quebec | Yes | Sprinter | Yes | No | Intermediate |
| Raleigh | Yes | Advancer | Yes | Yes | Intermediate |
| San Antonio | Yes | Advancer | Yes | Yes | Intermediate |
| San Diego | Yes | Advancer | Yes | No | Intermediate |
| San Francisco | Yes | Advancer | Yes | Yes | Intermediate |
| Seattle | Yes | Advancer | Yes | No | Leader |
| Toronto | Yes | Advancer | Yes | Yes | Leader |
| Tulsa | Yes | Advancer | Yes | No | Intermediate |
| Vancouver | Yes | Advancer | Yes | Yes | Leader |
| Victoria | Yes | Advancer | Yes | Yes | Intermediate |
| Washington DC | Yes | Advancer | Yes | Yes | Leader |

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