



From smart to smarter cities

Leveraging integration, data and enablement for sustainable and resilient urban transformations.

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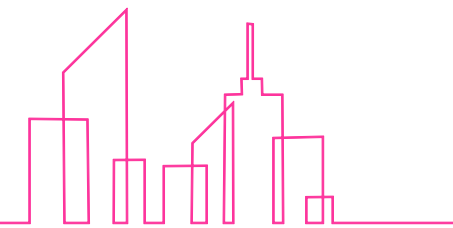
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Foreword



The cities we live in today are inadequate for the needs of tomorrow. We are at a critical juncture and must avoid reinforcing superficial, short-term solutions that barely address the deeper, more complex urban challenges we face.

Cities are where humanity’s greatest challenges will be addressed. Cities will lead the energy transition, define social equity, develop climate resilience and deliver economic transformation. They provide the ecosystems to innovate and the scale to create new markets. Cities are where citizens, governments and entrepreneurs come together to optimize quality of life and jointly solve problems. They are where creativity, work and play meet.

As the world faces multiple interrelated challenges, it is in city halls, on city streets and in city business districts that humanity’s destiny will be decided. It will look different in the Global North and the Global South, between large cities and small ones, between democracies and autocracies. But the pressures will be no different and citizen demand for a better future will be no less pronounced.

Smart to smarter

This report explores how a focus on becoming more **integrated, data-driven and enabling** can help city decision-makers, infrastructure

leaders and private companies accelerate their smart city agendas. Integration unlocks insight and value. Data fosters smart decision-making. A focus on enablement reframes the conversation about what government delivers and creates space for greater collaboration and for new ideas to flourish.

The report unpacks these three priorities in the context of the six key challenges facing cities today — urban planning, infrastructure and technology; data and privacy; transportation and mobility; sustainability and social equity; governance and oversight; and funding and financing.

KPMG professionals have deep experience working with cities to help drive sustainable outcomes for citizens. Based on our work and supported by key data points and insightful commentary from city leaders and industry influencers around the world, we provide real examples and case studies of how the leading cities are embedding these priorities to accelerate their journeys from smart to smarter.

This report is aimed at city decision-makers, policy makers, infrastructure leaders and private companies who share our view that cities must move quickly from smart to smarter to help humanity solve today’s most pressing challenges. To learn more about the ideas raised in this report — or to discuss your city’s unique challenges and vision — please feel free to reach out to any of the contributors listed within this report.



Richard Threlfall
Global Head of Infrastructure
Government and Healthcare (IGH)
KPMG International

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A vision for smart, sustainable and resilient cities

In the fast-paced and ever-expanding canvas of urban life, cities must reimagine their existence through a lens of inclusivity and innovation.

Allow me to paint a picture. Visualize your city as a living, breathing entity that embraces the voices of women, children, the young, the marginalized, and those with mobility constraints.

Envision a realm where the future is shaped by the embrace of cutting-edge technologies — digital twins, AI, Big Data — interwoven with a commitment to protecting our environment, to sustainability and circularity.

Here, every choice, from building materials to travel modes, is a testament to our devotion to the planet.

And at the heart of this vibrant tapestry lies genuine citizen engagement, where every individual is not just a spectator but a vital contributor to the city’s evolving narrative.”



Sarah Varghese
Partner, Head of Cities Advisory
KPMG in the Middle East

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Lloyd is a specialist in urban transformation and a key member of KPMG UK’s Infrastructure Advisory practice and the Global Cities Center of Excellence. Since 2021, he has worked with cities globally, providing strategic advisory services to city authorities, local governments, and central governments on major infrastructure and urban development projects.

Recently, Lloyd has been working as a project fellow with the World Economic Forum’s Centre for Urban Transformation, contributing to the Davos Baukultur Alliance by supporting efforts to improve urban planning, construction and sustainable community development on a global scale.



Sarah Varghese
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Sarah Varghese leads the Cities Advisory Solution within KPMG in the Middle East Infrastructure practice. Sarah is an International City Strategist and graduated with a master’s degree in Urban Design and bachelor’s in Architecture. She is an Urban Transformation Leader with 25+ years of global experience — both private and public — gained in Australia, the Middle East, the UK and India. With her substantial experience in the design and delivery of major urban and city-shaping projects and associated infrastructure, particularly those entailing complex stakeholder management, tourism, and investment attraction strategies, Sarah brings a fresh global perspective to city and municipal challenges.



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Eric has almost 18 years of experience in KPMG in Canada’s Infrastructure Advisory practice in Toronto. His focus since joining the team has been on assisting public sector clients (municipal, provincial/ state, and federal) in Canada and internationally with respect to the planning, procurement, funding and delivery of major infrastructure projects. In 2022, Eric was named the National Cities Lead for KPMG in Canada and has been active in the municipal space assisting clients with business transformation activities and delivering major infrastructure programs and initiatives.

Introduction

The status quo is broken



This is not the first time that cities have served as the crucibles of global transformation. Cities in ancient Rome and Greece helped the world evolve out of an agrarian culture. Cities in Europe (and less famously in Africa and Asia) helped the world move from the Dark Ages. Sitting at the crossroads of ideas, cities have served as the stage for the industrial revolution, suffrage and the invention of the internet.

Yet none of these transformative epochs were achieved by following the status quo. Transformation requires innovation and reinvention. And many cities around the world face the need to take a new approach to city planning and management.

The reality is that cities are reaching a crisis point. They are under massive pressure to become smarter — to modernize, digitize and decarbonize. City populations are growing.¹ Citizen satisfaction with government services is weakening.² And net zero deadlines are looming. Cities recognize that their traditional approaches to city planning, development, management and renewal will not get them to their goals in time. They must become smarter, more integrated, data-driven and enabling.

The good news is that, around the world, cities are making tremendous progress experimenting with solutions, driving innovation and building capacity. We are seeing significant investment flow into Smart City technologies, platforms and solutions (Frost and Sullivan predict smart city spending could reach US\$327 billion by 2025).³ Cities are investing in transforming their policy, technology, finance, social equity and partnerships. Digital capabilities and capacity are being created and enhanced. New tools and InfraTech solutions are coming to market.

Yet even with more tools, capabilities and technologies, many cities continue to struggle to deliver on their citizen’s needs and city objectives.

We would argue that many of the challenges they face stem from three root causes: siloed thinking, legacy decision-making and outdated views on the role of the public sector, citizens and the community. Let us explore and explain these root causes in more detail.

Siloed thinking

While specific point solutions and discreet digitization and decarbonization projects (such as electrifying a bus system) are certainly delivering some tangible benefits and progress for cities, the real value comes when activities, investments, partners and strategies are integrated at a precinct, city and systemic level.

Collective integration allows governments to align stakeholders and set priorities, thereby helping ensure funding and capabilities flow to the right initiatives and projects at the right time. It ensures that interdependencies and commonalities are understood and leveraged — reducing effort and risk. It opens opportunities for collaboration between the city leaders, city practitioners, communities, industries and investors. And it encourages innovation, allowing new ecosystems to come together to reimagine processes and workflows from the citizen’s point of view and define the desired long-term impacts in collaboration with the community.

The antidote to siloed thinking is integration. And that starts with a clear, shared vision of what makes your city unique, what your citizens expect and what you want to achieve. Agreement there can allow city leaders from both public and private sectors, bottom-up as well as top-down, to identify the key performance indicators they want to influence which, in turn, will lead the city’s strategic planning, investment strategy and collaboration focus.

How ‘system thinking’ accelerates outcomes

All too often, city leaders and infrastructure players focus on individual projects rather than the broader outcomes they should deliver, leading to initiatives that fail to create lasting value. The starting point must be better outcomes for people, society, and nature, recognizing that the challenges faced by smart city leaders are systemic and involve the entire interconnected system — where energy, transport, water, and waste are interdependent and serve humanity.

This systemic perspective reminds us that no single project can solve these complex challenges on its own. Instead, we must view projects as interventions within these systems, aimed at building environments and infrastructure that serve as the foundation for positive outcomes. And, by understanding these systems better, we can intervene more effectively to address generational challenges.

To help create real value, it is essential to break down silos, adopt a system-based approach, and aim to ensure that interventions are comprehensive and forward-thinking, ultimately leading to sustainable and impactful change.



¹ World Cities Report 2022, UN Habitat, 2022
² Embrace your digital citizen: Citizen Experience Excellence 2023-2024, KPMG LLP, 2024
³ Smart Cities to Create Business Opportunities Worth \$2.46 Trillion by 2025, Frost & Sullivan, 29 October 2020

According to a [recent survey of government technology leaders](#) conducted by KPMG International, the desire for greater citizen-centricity is already driving decision-making. The survey finds that the public sector is one of those most likely to launch digital transformation projects in response to customer feedback: 48 percent of government respondents say this was the main trigger for change, compared with 42 percent from other sectors.⁴

As we illustrate later in this report, many of the leading smart cities have found ways to create an ‘orchestration’ layer that supports, encourages and directs integration efforts across various city entities and stakeholders. In India, for example, that role is played by a Special Purpose Vehicle or independent board.⁵ Some European cities have established independent transition boards to advise their city leaders. In other jurisdictions, the role is assumed more directly by civic leaders or government institutions.

Legacy decision-making

Cities can no longer make decisions alone, based only on gut feel and benchmarks. Today’s pace and pressure of change requires rapid decision-making and execution. The world has changed too much and too fast over the past few years: social expectations have evolved; climate risks have become more active; social inequalities have become divisive; and ways of working and purchasing behaviors have been revolutionized. What was true just five years ago may not be valid thinking today. As pollsters and politicians are rapidly finding, historic benchmarks and assumptions are no longer reliable.

Fortunately, this rapid debasing of historic data comes at a time of unprecedented data richness. Massive amounts of data are being generated by people and machines across the public and private sectors (according to the OECD, digital technologies now generate

2.5 quintillion bytes of data every day and just 1 percent of IoT data has been fully utilized).⁶ Indeed, the data currently exists at a reasonable quality to provide government leaders and decision-makers with near real-time insight into exactly what citizens are thinking and requiring, how operations are performing and where their investments should be going. High-quality data — the kind needed for monitoring and reporting — is also rapidly improving.

Yet at the same time, due to social media and new forms of communication, city leaders need to offer much more transparency about the direction they are taking while also unlocking human capital and creativity to explore new ways of financing and distributed leadership. The bottom-up/top-down framing is less about information, agency and subsidiarity, and more about empowering and collaboration.

⁴ *KPMG global tech report: Government and public sector insights*, KPMG International, 2024
⁵ *Smart Cities: Promoting Urban Governance in India*, World Economic Forum, October 2023
⁶ *Smart City Data Governance: Challenges and the Way Forward*, OECD, Urban Studies, 13 October 2023

Indeed, according to [KPMG’s Net Zero readiness spotlight](#) on cities, attracting and retaining human capital to support cities in driving their ambitious climate action plans is a challenge both in developed and emerging cities.

Shifting to data-driven decision-making, however, requires significant effort, investment and culture change. It needs a clear data strategy that includes data governance, security, management and standardization. It requires enabling technologies like cloud computing and massive amounts of compute power (particularly if AI is going to be analyzing some of that data for you). And it demands governments, public sector entities and city authorities to become much more collaborative about the way they share data internally across departments, levels of government, with private sector players, not-for-profit organizations, and with citizens.

Focus on outcomes

Governments cannot deliver everything that citizens and businesses require on their own. They simply do not have the required financial resources, capacity, capabilities or technology. Therefore, rather than focusing solely on delivering services, city leaders should be focused on enabling outcomes. The shift in mindset could be revolutionary.

As we illustrate using examples and client stories in the following chapters, a focus on enabling opens the door to massive innovation and new approaches. It creates space for greater cooperation, public-private partnerships and private investment. It encourages new — more citizen-centric — processes and workflows. It fosters a long-term mindset to define and measure positive social impacts for all stakeholders and communities. It reshapes where scarce resources are invested. It encourages approaches that are more adaptable to the pace of change. And it leads to better collaboration around data and services.

Enablement can also be critical at the citizen and asset levels. A focus on service delivery can usually prioritize the best solution for the majority; a focus on enablement prioritizes the best solution for everyone and is based on core human needs. It’s the difference between thinking about a metro versus thinking about mobility. And, when achieved through citizen-centric and co-creative design, it can help smart cities shift from a focus on delivery to a focus on outcomes.

Intentional adoption of smart, digital experience-centric solutions — knowing what stakeholders are expecting and meeting every expectation fully and consistently — will likely be critical in overcoming today’s challenges and aligning city services to the needs and well-being of the public as never before. The strategic, informed outcome-based use of digital technology is expected to be a key to successfully shaping cities and their services for a new era.⁷

Clearly, not everything can be delivered through enablement. Some city services are simply too complex, costly or critical to leave to market forces alone. Yet, even in these spaces, city leaders should be exploring how they can help enable their people to deliver outcomes more efficiently and effectively leveraging private sector technologies, tools and solutions.

Let’s make it practical!

In the next chapters, we unpack these three priorities — integrated, data-driven and enabling — across the lens of the six key challenges facing cities today:

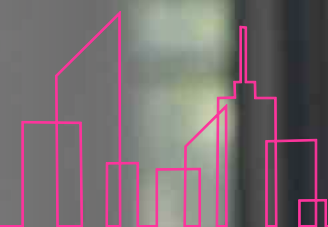
- Urban planning, infrastructure and technology
- Data and privacy
- Transportation and mobility
- Sustainability and social equity
- Governance and oversight
- Funding and financing

Leveraging key insights based on KPMG professionals’ experience working with leading governments and infrastructure providers, the following chapters providing examples of how today’s leading cities are incorporating these principles into their strategy to accelerate real progress on their city agendas.

⁷ *The future of cities*, KPMG International, 2021



Urban planning, infrastructure and technology





Facing a diverse set of demands and expectations, cities are struggling to ensure their urban planning, infrastructure and technology strategies are delivering the impact and value citizens and stakeholders expect. Rather than focusing on the what, we recommend city leaders focus on the how.

Integrated

At the city level, an integrated and future-focused masterplan and coordinated strategy is a key to driving impact and value from investments. It allows decision-makers to identify their priorities, harness any possible synergies and help ensure the enablers are in place for success. As we have seen in places like Singapore,⁸ integrating the masterplan with a long-term infrastructure and technology plan helps ensure resources are flowing to the right projects at the right time.

At the system level, an integrated view allows governments to focus on outcomes over deliverables, thereby opening a range of new service options. If you focus on enabling high-quality education versus building schools, for example, a whole range of new ideas and models come into play that can be integrated to achieve the stated outcome.

At the technology level, integration is all about interoperability. That requires robust data standards and enabling technologies, as well as a clear understanding of how integration delivers impact and value, and for whom. Open data models and approaches will likely play a central role, particularly as cities start developing solutions in-house. Cities will also want to ensure they are retaining ownership over their data to avoid vendor lock-in and enhance solution flexibility.

As noted in *Shaping Cities of Value*,⁹ a report spotlighting the outcomes of the 2023 Asia Pacific Cities Summit, city leaders recognize the importance of integrating technology with physical infrastructure and a sustainable approach to city planning, guided by a strong focus on the needs of citizens and effective collaboration across stakeholders.



Vendor lock-in can create significant challenges for cities in terms of flexibility, cost and resilience,” says Victoria Hanley, Assistant Manager, KPMG in the UK.

“We’re helping cities become much more sophisticated in the way they negotiate and procure for technology — in many cases helping them to ensure that the data layer remains platform agnostic and within the control of the organizations or individuals that own it.”

⁸ *Singapore Geospatial Master Plan 2024-2033*, Singapore Land Authority, 2024
⁹ *Shaping Cities of Value*, KPMG International, 2023

Client story

Digital Flanders: Creating a regional digital strategy

KPMG in Belgium supported Digital Flanders in guiding the digital strategy working group to develop an integrated Flemish digital strategy in collaboration with various Flemish entities, including the Flemish government, local authorities, as well as the broader Flemish economy and society.

The strategy aims to answer the question of how digital technology and data can best be utilized to address the most significant societal challenges and to achieve an efficient government that optimally and proactively meets the needs of citizens, businesses and associations.

Focused on four thematic workshops — skills and citizens’ digital gap, infrastructure, digitization of businesses and digitization of government — each workshop focused on two objectives: identifying priorities in transversal societal goals and identifying concrete actions for the government to address societal goals using digital technology.



Data-driven

Data is central to ensuring impact and value from infrastructure investment. Decision-makers require data to decide where to focus and how to achieve their goals. City leaders need data to drive development and attract investment. Operators require data to enhance operations and unlock cost and energy efficiency. Data drives customer engagement and access. And it allows stakeholders to monitor activity and progress against outcomes.

The way data is used and presented drives adoption and ensures impact and value. Decision-makers and asset operators, for example, will likely want to see data presented in a digital twin or effective visualization that enables 3D decision-making.

Data from the World Economic Forum suggests digital twins not only help reduce project and building costs by 35 percent, but they can also help reduce carbon emissions by 50 to 100 percent.¹⁰ Citizens will want to access data through platforms and apps, allowing them to pull up the data they need in order to make their own micro-decisions (such as what mode of transport to use or when to travel).

The challenge will be in encouraging all parties to share their data. In part, this will come down to appealing to the concept of data as a Public Good. The Collaborative, Secure and Replicable Open Source Data Lakes for Smart Cities (ODALA) is a great example of a strategic project to improve data management in cities.¹¹ But self-interest will also play a role: citizens and stakeholders will need to understand — and experience — how their data is helping to create a better city for them specifically.

“If you are the transport authority, for example, you may want to access data on emissions, air quality, and energy use if your asset is electrified. You want citizen data and usage data. You need financial data and operational data,” adds **Dr. Peter El Hajj, Associate Director Major Projects Advisory, KPMG in the UK.** “More importantly, you need to be able to view it all in a way that allows you to make better decisions and realize better outcomes.”

¹⁰ Digital twin technology can help decarbonize cities. Here’s how, World Economic Forum, 29 July 2021
¹¹ Collaborative, Secure, and Replicable Open Source Data Lakes for Smart Cities, ODALA, accessed 5 September 2024

Case in point

EU's Data Spaces project

Funded by the European Commission as part of the Digital Europe Program, the Data Spaces Support Centre will facilitate common data spaces in different sectors that collectively create an interoperable data sharing environment.

Coordinated by the Fraunhofer Institute for Software and Systems Engineering (ISST), the DSSC project includes a consortium of leading associations and knowledge centers in the domain of data spaces, with a broad membership, an extensive network, national hubs, open-source communities and data space pioneers. The Support Centre explores the needs of the data spaces initiatives, including common requirements and best practices. It delivers the Data Spaces Blueprint, composed of common building blocks in business, legal, operational, technical and societal aspects. With a user-centric approach and cooperatively with all stakeholders, the Blueprint continuously evolves. It drives adoption through support activities, a platform and web portal for knowledge and asset sharing, a help desk, toolboxes and active engagement with all stakeholders.

Source: Data Spaces Support Centre launched to facilitate interoperable data sharing, Digital Europe, 18 October 2022



Q&A with Joel Mills, CEO, Offshore Simulator Centre and AugmentCity

Q: People have been chasing digital twins for years. What is different today?

JM: There are two big forces driving uptake of digital twins. On the demand side, I think city leaders recognize that they aren't going to get to their net zero goals unless they can make changes at speed. And digital twins allow decision-makers to do just that.

At the same time, the technology has matured significantly in the past two years. At AugmentCity, we recently worked with the City of Oslo to build a digital twin that would allow them to model how 5 million people move around the city. With cloud computing and AI, we can now run 500 different simulations an hour for them, allowing them to make rapid data-driven decisions.

And the process is amazingly fast. In the past, it would take years to build a digital twin of a city. We recently created one for Berlin — modeling every street, building and bush in the city — in less than a week.

Q: What are AugmentCity's models helping city leaders find?

JM: We're using digital twins and visualizations to help city leaders reduce their risk and understand opportunities at high speed. Cities are complex ecosystems and — generally speaking — everything is created in siloes. So, our objective is to pull the relevant pieces of a city's real-world data into our digital twins in ways that allow city leaders to see the interdependencies.

We work with developers and city planners, for example, to assess how a new development might impact traffic flow in a region. Then we use the twin to run hundreds of simulations to identify the most efficient and effective solutions to those problems. We also recently worked with KPMG in the US and the City of Ithaca to help them enhance their environmental resilience plans and flood awareness.

Q: What is stopping cities from creating digital twins?

JM: Honestly, I think it is the misconception that digital twins are really hard, expensive and require a lot of upfront work. But, in reality, you can stand up a digital twin of a large city in a matter of days with readily available information like LIDAR data.

I think it took time for digital twins to really fulfil their promise and earlier experiences may have discouraged city leaders. But technology has matured to a point where it has become the thing we always dreamed it would become. And at a level of simplicity that makes it accessible to all.



Joel Alexander Mills is a pioneer of simulation and intuitive data visualization with a background as an Industrial Designer. Currently CEO of two successful cutting-edge Norwegian companies using disruptive technology to transform the future of our ocean and cities, Joel holds a number of advisory roles in the UN and for the Norwegian government, is a guest lecturer at Harvard and NTNU Universities and a board member for a number of companies.



“

We are helping real estate investors, developers and operators apply AI and automation technologies at the property, portfolio and enterprise level. As these players become more interconnected to the systems around them, I believe we are going to see significant partnership opportunities between real estate players and city service delivery partners around sustainability, security, data provisioning and improved quality and service levels.”

Sander Grünewald

Global Head of Real Estate Advisory
KPMG International

Enabling

This is both about enabling the delivery of assets and enabling the use of assets. On the delivery side, the leading cities are focusing on creating the right environment — through policy, collaboration, investment and open data, for example — to encourage private sector ideas and investment to flow into the city.

Consider, for example, the way that Japan’s national government has been working to create an enabling environment for automated vehicle technologies by revising their Road Traffic Act to allow for Level 3 and Level 4 autonomous driving.¹²

On the use side, this is about enhancing infrastructure and technology access through better education, simple user interfaces and the removal of barriers. Data can tell you, for example, why certain demographics or segments of your city are not using a service and can often show you how to address the issues.

Ultimately, the impact and value of policy and infrastructure investment is in the outcomes and opportunities it enables for users. The focus for city leaders, therefore, should be on the outcomes they want to achieve rather than the specific asset or technology they want to implement.

“

What’s key is making sure the technology or asset being deployed is aligned with the outcomes you are hoping to achieve,” says **David Smallbone, Director, Asset Management & InfraTech Advisory, KPMG in the UK**. “We’ve seen so many programs start off with the technology in mind and invariably these fail to achieve their objectives or get adopted since often nobody really understands how it delivers value.”

¹² Japan leads the world in development of laws related to autonomous driving, Meiji.net, 4 March 2024

Client story

Creating a digital twin ecosystem for Infrastructure Ontario

Infrastructure Ontario recently developed a high-level strategy to launch a digital twin ecosystem in Ontario, as part of their wide range of services to support the Ontario Government’s mandate to modernize and enhance the value of public infrastructure.

KPMG in Canada’s team worked with Infrastructure Ontario to help inform the high-level strategy for a digital twin ecosystem in the province. This included the case for change, jurisdictional scans, leading practice analysis, design principles and overarching governance, as well as early development activities for both broadband and transport data collection and management, which provided the underlying fundamentals for digital twin enablement in the province.

The Canadian team supported the definition of an effective digital twin program strategy based on a clear understanding of the digital twin context and use cases, underpinned

by leading global insights from the KPMG organization. The team helped Infrastructure Ontario articulate several elements, including enablement, design and deployment of practical digital twins to support relevant use cases.

The team then helped Infrastructure Ontario articulate the operationalization of their proposed strategy by drafting the initiative structure, including program workstreams, roles, responsibilities and budget around the data management, system development and decision-making capability required to execute the digital twin rollout. They also supported the development of the business case for potential initiatives.

Ultimately, KPMG in Canada’s work was to map out a pragmatic digital twin rollout for the next several years, supported by key capabilities, benefits, milestones, anticipated challenges and critical conditions for success in each phase of the digital twin maturity lifecycle.





Data management and privacy

Data is the lifeblood of a sustainable smart city. But to deliver real value, it must be integrated, open and standardized — with robust and transparent governance and controls to help ensure privacy and security. The big question isn’t who owns the data or where it resides, but rather how it can be shared and what outcomes it can deliver.

Integrated

An integrated data and implementation strategy is paramount to success. Many of the world’s most advanced cities — places like Singapore — are those that started their transformation with an integrated data strategy.¹³ That allowed them to create a strong, reliable and consistent foundation upon which to enable decision-making, service integration, innovation and investment.

Other cities are looking to technology to help drive rapid data integration across government agencies and functions. In India, this is being encouraged through the adoption of a country-wide Open Smart Code repository for cities developed by the Ministry of Housing and Urban Affairs but based on open coding and offered to municipalities for free.¹⁴ It has been instrumental in, for example, helping cities integrate sensor data with traffic and pollution data to improve road services in key cities.

The EU is also working to help encourage data integration between and within cities. Its Digital Twin Toolboxes and Data Spaces programs, for example, are helping drive a level of data standardization and control across EU cities (and beyond).¹⁵ And the European Commission’s efforts around the Intelligent Cities Challenge,¹⁶ as well as key initiatives such as Horizon EU’s Building Intelligent Positive Energy Districts program¹⁷ are helping to integrate ideas and innovation across the bloc.

¹³ *Digital Government Blueprint*, Smart Nation Singapore (accessed 10 August 2024)
¹⁴ *SmartCode: Fostering Collaboration and co-creation*, Ministry of Housing and Urban Affairs, Government of India, accessed 5 September 2024
¹⁵ *Local Digital Twins: Forging the Cities of Tomorrow*, European Commission, 21 October 2021
¹⁶ *Intelligent Cities Challenge*, European Commission, accessed 5 September 2024
¹⁷ *BIPED: Building intelligent positive energy districts to fast-track climate-neutrality*, OASC, 25 January 2024

“
We’re working with city leaders to help them use their data to get better line of sight into the constraints and investments needed to enable their objectives. There are important interdependencies and synergies to be found, and that requires a lot of reliable and consistent data, at the right scale to help city authorities in their planning.”

Stephen Purcell
Director, Corporate Finance
KPMG in Ireland

Case in point
Melbourne, Australia

Melbourne is working towards smart city development initiatives that address climate change as well as the city’s rapid population growth. One of its key smart city initiatives is an open data platform with almost 100 datasets that anyone can access and use, such as pedestrian tracking data for the city’s busiest locations and real-time parking information, and a network of more than 400 solar-powered smart rubbish bins with sensors able to detect when they need emptying.

Source: Smart Cities Industry Report, Mordor Intelligence, 23 April 2024



Data-driven

It is a frequently used refrain: garbage in, garbage out. If data is the foundation of effective decision-making, then city leaders must place significant focus on ensuring their data is reliable, resilient and robust. This starts with gaining a clear understanding of the value of your data, how it can be used and by whom. How, for example, might transit data be shared with private sector players to create new solutions for transit users? And how might that translate into opportunities for partnerships, investment or improved service provision?

While good data is key, not every decision requires perfect data. Some insights can be gleaned (to a high level of confidence) based on reasonably good data. In other cases, perfect data does not yet exist (such as for biodiversity, for example) and cities will need to use proxies and imperfect benchmarks to start. Understanding the quality of data that you require for different decisions can help accelerate the pace of transformation.

“We are working with clients to help embed security, privacy and resilience ‘by design’ principles into their processes to help ensure they have the right architecture and infrastructure in place to drive trust and adoption of their smart city initiatives,” says **Ton Diemont, Partner, Head of Cybersecurity & Data Privacy, KPMG in Saudi Arabia.** “You don’t do that in isolation — you really need to do that holistically across your ecosystem to maximize the value and minimize the risk.”

¹⁸ *Who We Are*, Department of Statistics Singapore, accessed 6 September 2024

Contrary to popular debates, this is less about who owns the data than it is about how accessible and reliable it is. Data ownership will play out in a variety of ways around the world — some may centralize data under one or a variety of government agencies; others (like Singapore) have followed a more decentralized approach where data is owned by line departments but standardized to encourage interoperability.¹⁸

At every step, city leaders must also be aware of the limitations of their data, the security and privacy of the data, as well as any potential biases or risks embedded in their data or their models.

At the same time, decision-makers must recognize that data and digital enablers are a tool, not a goal in itself. Data and digital should be focused on helping to design long-term policy and investment models that go beyond short-term and quick-win politics and entrepreneurship. And that requires decision-makers to act upon the insights offered.

Insight Digital twin success factors

By Naina Gazula, Senior Manager, National Digital Infrastructure Lead, KPMG in Canada

Digital twins offer a high value and return on investment opportunity. But what does it take to create a sustainable digital twin ecosystem and an environment that encourages uptake and utilization? A look at existing digital twins across jurisdictions suggests there are three important conditions for success:

- **Solid technical foundations:** Foundational digital twin mechanisms, including roles and resources, core processes, and a technology enablement backbone, are critical for accelerating adoption of digital twins.
- **Quality data:** Accurate, standardized, up-to-date and accessible data sets are essential to informing better infrastructure decisions. And that, in turn, requires regular data sharing, enhancement and maintenance, guided by appropriate legislation and governance standards.
- **Practical use case application:** A careful selection of use cases with a relative ease of implementation is the key to translating strategy into actions, testing technical delivery capabilities, understanding stakeholder requirements, engaging industry leaders and forming a ‘coalition of the willing’ from public and private stakeholders.



Enabling

Data enables outcomes. But only if it is the right data, accessible by the right parties and presented in the right ways. It must be open and standardized (at least within systems and ecosystems) to allow others to build impact and value on top of it and to encourage interoperability to speed up the integration of different platforms and applications. It must flow up to the decision-making level and down to the operations level to help ensure real insights are being raised and efficiencies harnessed. And it must be integrated with other sources of data to enable decision-makers to gain a more holistic view of their challenges and opportunities.

City leaders may also want to consider how they might manage their data to enable and unlock emerging technologies and future innovations. Artificial intelligence, for example, currently requires significant compute power, energy and massive amounts of searchable data. City leaders will want to assess whether they have encouraged the right enabling technology environment to unlock the enabling power of data.

The EU and UK efforts to create open data regimes around key industry verticals (such as banking) provide an excellent example of how governments can use their power to encourage this type of data sharing and enablement.¹⁹

“

Government can play an important role in helping ensure consistent standards,” argues **Gilles De Roo, Senior Manager, Business Consulting, Smart Cities, KPMG in Belgium**. “In Flanders, the Flemish Government has created data standards for more than 190 sectors and domains, which allows for a better flow of data across policy domains. And every public entity is obliged encouraged to use them, which allows cities to compare their data and unlock real insights.”

¹⁹ *Data: A new direction*, UK Department for Digital, Culture, Media & Sport, 10 September 2021

Three takeaways on community engagement from Kristina Verner, Senior Vice President, Strategic Policy and Innovation, Waterfront Toronto

01

Be very clear about what you think success can be to your community, so they understand what they are being asked to give and what they stand to get in return. Maybe they are being asked to give their data or an investment of time. They might need to take a bit of risk themselves to conduct some sort of trial. But being clear about what the tradeoff is and how it aligns to your city’s ultimate purpose goes a long way to creating public acceptance and participation.

02

Listen to citizens and give them a voice. Smart cities can be a lightning rod for a range of community concerns around privacy, ethics, data ownership and private participation, for example. Use the opportunity to create processes and projects that help to redefine how citizens shape these key issues. Rather than a barrier, citizen participation can serve as a watershed moment that fundamentally redefines the relationship between citizens and their built environment.

03

Take an ecosystem approach with government in the lead. Invariably, most smart city projects will require public-private partnerships and collaboration. And building the right ecosystem of players will be key to building trust with the community. This is about working together holistically as an ecosystem of partners who share the same values and vision, being clear about what can be accomplished and articulating progress and outcomes together — with government in the lead.



Client story

China: Creating a digital twin-based integrated facility management system

One of China’s largest landlords and developers sought to modernize, digitize and decarbonize their operations. Their ambition was to move from their traditional mode of reactive maintenance and human intervention to a more proactive, data-centric approach. In doing so, they hoped to enhance efficiency, reduce their environmental footprint and improve tenant satisfaction.

Working with KPMG China, the company developed an innovative integrated facility management control tower system concept that integrates more than 20 data sources (including HVAC systems, an array of IoT devices, asset information, work order management, security systems and other battery management systems data) to enable proactive asset maintenance, energy consumption predication and operational excellence.

The project has helped the client transform:

- Reactive maintenance to predictive maintenance
- Excel analysis to 3D visualization
- Experience-based operations to data-driven operations

- Scheduled inspections to continuous monitoring
- Siloed systems to integrated analytics
- Energy consumption to strategic energy management
- Passive comfort to AI-enhanced personalization

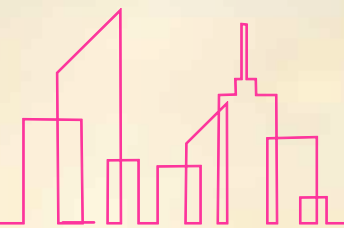
With its robust algorithmic core, the platform has transitioned facility management from passive consumption tracking to active energy optimization. Accurate occupancy prediction enables them to determine the minute Air handling unit (AHU) start-up time and optimize the system operations to enhance energy efficiency of system operation. In addition, the AI-enabled predictive maintenance can optimize the system replacement period and extend the lifespan of equipment to reduce the embodied carbon of product or equipment purchase.

The company now has plans to integrate the platform into their entire city center property portfolio by 2025, supported by expanded data lake capabilities and new dashboards and building information modeling.





Sustainability and social equity



What makes the world’s most livable cities so attractive? It is their focus on creating spaces that are environmentally, socially and economically sustainable and services that leave no citizens behind. Ultimately, this is about how city, regional and national governments can unlock opportunities for their citizens to thrive in a changing world.

Integrated

Environmental, social and economic sustainability are inextricably interlinked. The reality is that virtually every decision that cities make will have an impact on all three areas. As such, cities will need to find their ideal equilibrium point — based on their vision for the city and the expectations of citizens — and then set clear priorities that address all three as needed.

This is about taking a ‘whole system’ view that recognizes these interdependencies and strives to integrate environmental, social and economic sustainability considerations into every decision (see the callout in the introduction for more on this).

A whole system view works at the system level (to prioritize mobility investment, for example) and at the city level (to assess the tradeoffs and opportunities created by policy, for example).

There are several cities doing this well — particularly in India where the smart cities mission is working with more than 100 cities to encourage neighborhood-led planning, decentralized governance and innovative funding models to help drive sustainable and social outcomes.²⁰ But around the world, many cities are enhancing their ability to measure, prioritize and weigh the impact of their decisions on environmental, social and economic sustainability.

“We are helping governments identify and monitor a range of social and environmental KPIs as part of their economic investment reviews,” says **Eric Wolfe, Partner, National Cities Leader, KPMG in Canada.** “With the scarce financial resources available to cities, it is critical that they maximize, among other things, the social and environmental returns on their investments. A key part of this is monitoring the performance of those investments to ensure they are achieving all their stated objectives.”

²⁰ Smart Cities Mission, India: Localizing Sustainable Development Goals, UN-Habitat. MoHUA, Gol. 2023



Case in point

The Davos *Baukultur* Alliance

The world is urbanizing at an unprecedented speed. Until 2050 the surface area equivalent to the size of Singapore or New York will be built every month and is outpacing population growth. At the same time small towns and rural areas are struggling with shrinking populations.

The Davos *Baukultur* Alliance unites public and private sector stakeholders around a shared set of principles to advance the planning, construction and management of more inclusive, sustainable and vibrant communities.

What is *Baukultur*?

The word *Baukultur* means building culture. *Baukultur* sees the entire designed living environment as a coherent whole, from existing buildings to contemporary design, from small, handcrafted details to buildings and open spaces to large-scale infrastructures, and from the planning process through construction and operation to reuse.

The *Baukultur* movement received a major boost in the Davos Declaration of 2018 when European Ministers of Culture called for policies of high-quality *Baukultur* for Europe. In 2023, the Davos summit called for a better balance between technical/economic and cultural/social aspects of *Baukultur* — focusing on improving cooperation between authorities, civil society and the building and real estate industry to promote *Baukultur* as a common good. Then, at the Venice Architecture Biennale 2023, the Swiss Federal Office of Culture, UNESCO and the World Economic Forum hosted a kick-off meeting for Alliance members and special guests.

With more than 65 current alliance members, including national states, international organizations, international NGOs and private sector partners, the Alliance was founded on commonly shared values and priorities as stated in the Davos Declaration.

What are the goals of the Davos *Baukultur* Alliance?

The Alliance aims to concentrate its work in three primary focus areas and one place-based implementation group:

- **Affordability and social value creation:** The Alliance seeks to incentivize and accelerate adoption of high-quality *Baukultur* within urban regeneration projects and how it can be structured to embed and drive social value for communities.
- **Resilience and climate adaptation:** The Alliance aims to identify ways to help mitigate the risks of extreme weather and natural disasters, advance more resilient communities, and adapt to climate change in communities as part of the advancement of high-quality *Baukultur*.
- **Sustainability and circularity:** The Alliance will aim to incentivize and accelerate adoption of sustainable and circular construction models, retrofitting of buildings and improved special planning to advance net zero and nature positive communities.
- **Special issue: Rebuilding Ukraine:** A special place-based focus group working and anticipating frameworks to ensure the consideration of high-quality *Baukultur* in the rebuilding process, including with respect to Ukraine's unique and heavily impacted culture and heritage.

“

By uniting governments and businesses around a set of global quality standards, the alliance promotes a holistic approach to community planning, development, and management, aiming to create more inclusive, sustainable, and vibrant communities.”

Lloyd Harriman, Manager, Major Projects & Cities Advisory practice, KPMG in the UK and Urban Transformation Specialist/Fellow, World Economic Forum

Data-driven

As you work to find and maintain a balance between environmental, social and economic sustainability, data and evidence will likely be critical. City leaders will need to take a data-driven approach to setting the sustainability priorities for the city. Operators will need data to monitor their progress and create suitable interventions. Regulators and policymakers will need data to help ensure governance and oversight. Perhaps most importantly, citizens and businesses will need data and evidence to drive confidence and support for city sustainability programs.

Reporting will also be a critical first step as cities strive to achieve their stated environmental, social and economic sustainability goals. Many cities have set clear targets to achieve net zero carbon emissions or progress on the UN’s Sustainable Development Goals, for example. Data and evidence will be needed to help decision-makers assess their options, measure their impacts and report on their progress so that all stakeholders (particularly interested investors) have full transparency on the journey.

On the consumer side, real-time transparent data can be democratized to help people make informed decisions regarding their personal lives, based on an understanding of how their actions impact other communities in the broader system. When a person can see their routes and transportation options with a link to their emissions, for example, they have more information to pick a mobility option that helps them stay safe, arrive on time and reduce their carbon footprint.

“Decarbonization and resilience are the two biggest topics for smart city infrastructure. Any city that is not using most of its smart city assets to decarbonize and ensure the resilience of those assets providing essential services is missing the point.”

Richard Threlfall
Global Head, Infrastructure, Government and Healthcare (IGH)
KPMG International



Client story

+CityxChange: Applying a smart monitoring and evaluation methodology

+CityxChange (+CxC) was a European-wide smart city project supported and funded by the European Commission. The aim was to develop a series of feasible and realistic demonstration projects in climate-friendly and sustainable urban environments. The Future Analytics team within KPMG in Ireland was a core part of the +CityxChange Consortium, and supported monitoring and evaluation activities, data analytics and dashboard development. The project commenced in late 2018* and was successfully completed in late 2023.

+CxC wanted to develop ‘Positive Energy’ Blocks/Districts through open innovation, combining the knowledge and experience of a wide range of different actors. The idea was to link systems of buildings, Micro/Community Grids and electric mobility as a service (eMaaS) and to connect markets with local trading platforms, district-scale flexibility markets and innovative financing and risk distribution models.

With the goal of scaling ideas regionally and nationally, the project aimed to find ways to implement end-to-end smart city system operations and planning at the European level.

The team worked with +CxC research partners, stakeholders and end-users to develop and apply a monitoring and

evaluation methodology that provided a clear, interoperable and transferable approach that ensured ‘upscaling and replication’ of project interventions.

Data was collected according to a flexible methodology and stored in a data repository on the Monitoring and Evaluation Reporting Tool (MERT) which was created by KPMG in Ireland as part of the ICT Ecosystem of the +CxC project and provided an online solution for capturing and managing quantitative and qualitative data according to a Key Performance Indicator Framework. The development of the MERT helped enable the display and sharing of project data in a way that is interactive and intuitive for project partners and the general public.

The project resulted in a set of practical recommendations for new policy interventions, community engagement, market regulation and business models that will enable the scale-up and replication of Positive Energy Blocks/Districts across Europe.

**KPMG in Ireland acquired Future Analytics Consulting Ltd. In November 2020.*



Enabling

In many ways, the focus here should be on enabling businesses and individuals to progress with achieving their own environmental, social and economic sustainability goals.

Take energy, for example: by creating the right policy environment and incentives around renewable energy, governments can encourage businesses and individuals to shift towards microgrids of clean energy — thereby reducing city-wide emissions, improving access to lower cost energy for citizens and cutting the capital costs associated with building new generation capacity centrally.

City officials should also be exploring ways to enable existing services and assets to help achieve their sustainability goals. In Norway, for example, municipalities have created a common taxonomy to help disaggregate Sustainable Development Goals (SDGs) indicators at a local level, thereby enabling decision-makers to view consistent data across cities while also providing them with the data they needed to engage with the private sector with transparent metrics.²¹



To me, the most important factor in sustaining a city is public acceptance and adoption,” adds **Yann Rousselot-Pailley, Director, KPMG Innovation Center, KPMG in Saudi Arabia.** “And one of the ways to make that happen is by involving the population in the governance process. Being a smart, sustainable city requires smart people to sit together and collaborate on their shared sustainability and city goals.”

²¹ Statistics Norway, 15 March 2021

Client story

City of Ithaca’s commitment to carbon neutrality

The City of Ithaca, New York, made history by becoming the first city in the United States to commit to achieving carbon neutrality by 2030. This ambitious government-led initiative began on 5 June 2019, with the adoption of Ithaca’s Green New Deal (GND) resolution, which focuses on addressing historical inequities, economic inequality and social justice.

In its quest for carbon neutrality, Ithaca enlisted KPMG in the US’s experience to explore net-zero pathways. The city required support in evaluating their existing GND programs, assessing their impact on infrastructure and mobility and establishing priorities. A particular challenge involved helping the City Council visualize static FEMA (Federal Emergency Management Agency) maps to understand their potential impact on the city’s infrastructure and mobility.

Working collaboratively with KPMG in the UK and AugmentCity, a simulation and visualization company, the team helped deliver a comprehensive solution that included:

- **Analysis and prioritization:** Conducted a detailed analysis of existing GND programs, prioritizing

them based on their impact on carbon reduction, infrastructure and mobility.

- **Data integration and digital twin creation:** Collected and cleaned data from various sources to develop a system-wide digital twin model. This involved translating static FEMA maps into a dynamic digital twin to visualize flood risk and its intersection with infrastructure and mobility.
- **Stakeholder engagement:** Facilitated regular engagement with key stakeholders, including the Mayor, City Council, Tompkins County and Cornell University, to ensure alignment and collaboration.

Today, the City of Ithaca enjoys an enhanced understanding of how they can achieve carbon neutrality by 2030, with key programs and significant carbon reduction impacts identified. Decision-making is informed by a fully interactive digital twin of the city, utilizing real data to provide insights into potential flooding scenarios and their effects on transportation and infrastructure. And a spirit of collaboration has been encouraged between the City Council, Tompkins County and Cornell University, supported by increased awareness of the GND and the role public and private sectors play in achieving its goals.



Q&A with Massamba Thioye, Project Executive UNFCCC Global Innovation Hub at UN Climate Change Secretariat

Q: What advice are you giving city leaders seeking to use innovation to decarbonize their cities?

MT: The first priority is to develop a vision based on the needs of the people and the planet. And my advice is to think much more broadly about what that means. For example, climate mitigation is not just about decarbonization — it's a development problem. We want to develop, but we want to do it in a way that is clean. That is quite different from saying we need to decarbonize an industry. And it opens a range of different options for satisfying citizen needs in a more effective manner.

Q: Do city leaders have the right mindset to achieve their goals?

MT: Actually, a lot of what we do at the UNFCCC Global Innovation Hub is about helping city leaders get the right mindset. To me, it is about being caring, sharing and daring. Caring helps foster collaboration and commitment. Sharing best practices and ideas reduces the cost of climate innovation. And the daring part is all about setting goals based on what is needed versus what you believe to be possible.

Q: What is your call to action for city leaders?

MT: It is not enough to have a great vision — it must be tuned into concrete climate and sustainability action by leveraging systemic innovation and collaboration to really challenge the way we are thinking, challenge the way we are acting, and challenge the way we are interacting. If we can do that, I am optimistic we can really address these big challenges facing humanity.



At the UNFCCC secretariat, **Massamba Thioye** leads the development of regulations pertaining to the measurement of climate action impact, incentive mechanisms for climate and sustainability action and a framework to enhance the use of innovation to support climate and sustainability actions. He is also Advisory Committee member of the European Green Digital Coalition and member of the Strategic Advisory Board of the Net Zero Guidelines.



Transport and mobility





Connectivity is what draws people to cities. It connects people to services, to work and leisure activities, to communities and to each other. Done right, it can also be a key catalyst to decarbonization and economic growth. Unlocking this value, however, will require cities to take a more integrated, data-driven and enabling approach to connectivity and mobility.

Integrated

Many cities already take an integrated approach to mobility — planning and investing across different modes to provide citizens with multiple connectivity and transit options. Now, the leading cities are working with mobility providers (such as rideshare platforms) and other emerging technology providers (Dubai has granted vertical take-off and landing air taxi licenses²²) to expand their options, create greater flexibility and enhance connectivity.

For greenfield cities created on undeveloped land or open space, this is about deciding where to place assets to make them accessible and then creating the required range of connectivity options to enable people to avail of them — essentially the premise underpinning the 15-minute city.

For older cities where infrastructure assets are more challenging to move, this is about using existing assets to offer more options (like creating cycling and walking paths, for example), creating new assets that can flex and shift as needs evolve, and supplementing or enhancing options to support a more just transition (as Quito, Ecuador did with their new metro²³).

Cities will also need to consider how mobility options are integrated into their broader infrastructure plans to ensure access and adoption. Electrifying a bus fleet, for example, may require investment into charging infrastructure, baseload generating power and roadways.



The electrification of vehicles will have a big impact on cities that rely on fuel taxes to fund transport and other infrastructure,” notes **Malini Bose, Associate Director, Mobility, KPMG in the UK**. “Distance road pricing will ultimately play a role. But governments need to be thinking about how they might generate alternate revenue streams from whatever combination of modes they integrate in the city.”

²² Joby Aviation to launch eVTOL air taxi rides in UAE, granted six years of exclusive operations in Dubai, electrek.co, 11 February 2024
²³ Quito Metro: A megaproject to transform mobility, World Bank Blogs, 6 December 2023

Case study

Singapore’s success with integrated multimodal transport planning

Singapore has a long history of both planning and implementing integrated multimodal transport plans, starting with the 1996 Land Transport Plan. Singapore, which already had a high modal share of public transit use, had ambitions to increase it to at least 75 percent. These increases are happening; prior to the pandemic, the modal share of public transport for motorized transport trips was 67 percent.²⁴ This increase reflects the benefits that have been achieved by integrating the system over time, including:

Physical: Policies help integrate both transport and land-use planning. For example, one policy stipulates that all transit stations for the mass rapid transit (MRT) system must be integrated with new commercial developments and connected to at least one other transport mode.

Network: In addition to the MRT, Singapore also has a light rail train (LRT) system. Both these systems are integrated with the bus network, which provides the overall foundation of the transport system.

Operational: In 1989 the government created a company called TransitLink tasked with coordinating information on routes, timetables and interchanges across all modes of transport.

Institutional: Following TransitLink, the government then created the Land Transport Authority which is both the planning and regulatory agency covering both public and private transport.

Source: Key considerations for integrated multimodal transport planning, International Growth Centre, February 2019

²⁴ Proportion of peak hour trips made on public transport have gone up, TODAY, 2 November 2018





Data-driven

At the macro level and at the micro level, data is key to driving decision-making. At a macro level, city leaders and transit authorities need access to reliable and integrated sources of data — including operational data, sustainability data, citizen data and usage data, for example — to make balanced investment decisions that also meet their sustainability goals.

At the micro level, citizens are looking for data to assist them in making their own mobility decisions based on cost, ease, timing, carbon footprint and preference.

City leaders and transport authorities should be considering how mobility data might be used to create better connectivity and drive greater value for citizens and users. Transport for London’s efforts to open their mobility data, for example, inspired the founders of Citymapper (now one of the world’s largest and most popular mobility platforms with more than 50 million users) to build their first app, thereby improving the efficiency of transit and the user experience considerably.²⁵ Other cities are monetizing their mobility data more directly through commercial agreements, for example.



India’s city governments have been using the MyGov platform to rapidly poll the public on their expectations, priorities and needs,” notes **Akhilesh Avanish, Lead Partner, Urban Transformation, Government and Public Services, KPMG in India.**

“That data has been critical to helping local governments prioritize their investments and plan interventions to meet the needs of citizens.”

²⁵ *Building a city without open data*, Citymapper, 8 September 2015



Enabling

A focus on enabling versus delivering shifts the conversation from assets to outcomes. And that could unlock a wide range of transport and mobility options and opportunities for city leaders. When the focus is on enabling citizen mobility versus building more metro or bus stations, for example, space is created for private participation, emerging technologies and alternative approaches (like taking services to citizens instead of moving citizens to services).

At the same time, city leaders should be thinking about mobility in terms of how it enables citizens to achieve their own objectives, particularly around environmental, social and economic sustainability. The shift towards a ‘15-minute city’ (though more recently we hear people talking about a 2-minute city) is, in part, driven by the idea of citizen enablement and hyper-connectivity to live, work and have leisure activity options.

“We are working with city governments to change the culture and mindset around mobility and transport,” adds **Ben Foulser, Partner, Public Transport, KPMG in the UK**. “It’s about connecting people with hospitals, connecting children with schools, connecting families and communities. Once you recognize that mobility is the glue that holds cities together, the rest of it starts to come together.”

²⁶ *Sustainable mobility in smart cities: a document study of mobility initiatives of mid-sized Nordic smart cities*, Daniela Müller-Eie and Ioannis Kosmidis, European Transport Research Review, 2023

²⁷ *Inclusive and accessible transport holds the key to achieving Net Zero by 2050*, KPMG LLP, 2023

²⁸ *Abu Dhabi rolls out Automated Rapid Transit (ART) system*, Gulf News, 11 October 2023

²⁹ *Key considerations for integrated multimodal transport planning*, International Growth Centre, February 2019

Yet — to make a truly livable city for all — city authorities will need to place particular attention on making their mobility infrastructure more inclusive and accessible. In a recent academic review of mobility initiatives in mid-sized Nordic smart cities, the authors noted lack of focus on inclusive and safe mobility planning.²⁶ As a recent report from KPMG in the UK notes, inclusivity and accessibility need to be embedded throughout the transport lifecycle from design to evaluation with inputs from currently excluded groups being at the heart of these decisions.²⁷

Given the rapid pace of change in technologies and citizen preferences, city leaders will also want to consider how their current investments and mobility assets enable future technologies and advancements. When building new lanes for a bus rapid transit line, for example, planners will want to consider how they might also enable the use of automated buses in the future — as Abu Dhabi has done with its new Automated Rapid Transit system.²⁸ Upskilling and reskilling may also be required in order to enable mobility transformation (as in Lagos, Nigeria where authorities trained minibus drivers to operate the bus rapid transit system²⁹).

Client story

Integrating a national bus network

With national bus usage falling, especially outside major cities, this country’s national transportation ministry wanted to transform the passenger experience.

They worked with their local KPMG member firm to bring the country’s more than 400 independent bus service operators together on an open data platform that would amalgamate bus timetables, fares and vehicle location information across the country.

Adoption numbers already suggest the project has been a huge success with passengers and app developers. As of July 2023, more than 3,000 app developers, mapping providers and researchers had registered to use the data. The system receives more than 2 million API hits per day. And more than 91 percent of operators are publishing their data in the system.

For the transportation ministry, the new platform offers administrators, planners and regulators access to rich sources of data to support policy making and oversight. It creates a more competitive environment for bus operators. And it provides the marketplace with a single aggregated repository of data which is encouraging innovation in the sector.



Q&A with Andrew Collinge, Non-resident Fellow in AI Practice, Mohammed bin Rashid School of Government

Q: What is the biggest challenge facing smart cities today?

AC: It has got to be data. In today’s complex environment, decision-making, new innovative business models and boosting productivity are all driven by good data. And that means having the right data and right rules in place to encourage as many parties as possible to use that data.

Sharing is key. There’s always an imperative to improve citywide collaboration around data and its use in smart cities. That isn’t just about sharing data it’s also about sharing skills between public and private sectors.

Q: How can governments encourage greater sharing of data?

AC: It is difficult, particularly when developing agreements to facilitate public data sharing and open data models. I think the key here is to be really focused on missions – around key challenges such as decarbonization, social equity, green energy transition and so on – where common ground and mutual benefit can be found.

We have a penchant for centralizing everything. Fight it. The way to create a responsive, resilient and adaptive government is through decentralized, distributed architecture, common standards and collaboration.

Q: What advice would you offer city leaders?

AC: Focus on applying the right technologies in the right proportions and on the absolutely mission-critical things that city leadership and citizens need to solve. Don’t dedicate all your precious time, resources and budget trying to build an everything-to-everyone data platform or digital twin. Rather, focus on small and modular and build value out from there.



With 15 years of experience in data and technology roles in world city governments, Andrew is an urban technology leader. He is a Fellow in AI Practice at the Mohammed bin Rashid School of Government, and a World Economic Forum contributor. He has led expert groups under the G20 Global Smart City Alliance to create model policies in areas like open data and whole of lifecycle approaches to infrastructure management.

Governance and oversight





Encouraging integration, unlocking data and empowering enabling outcomes across public sector, private sector and citizenry requires governments at all levels to take a holistic approach to governance and oversight. Governance and oversight are key to driving trust and should be the bedrock of smart city development and advancement.

Integrated

The approach to governance largely depends on the city culture, existing layers of government and the unique nature of the place. It may be led by an independent, stand-alone entity with a mandate for development and operation (in India, for example, this role is often fulfilled by a Special Purpose Vehicle led by a CEO),³⁰ a city council or governance board or even by a private entity (in the case of privately owned and operated places and spaces).

The key is to ensure they are aligned with the city's vision and that strategic decision-making is integrated at the highest level. Governance should also be aligned across outcome areas (versus simply by asset) to drive decision-making and help ensure insights are integrated and progressing the city's vision, agenda and objectives.

City leaders will also need to create ways to better integrate the private sector into governance, particularly when it comes to technology oversight and data management.

³⁰ *Special Purpose Vehicle (SPV)*, Smart Cities Mission, Ministry of Housing and Urban Affairs, Government of India, 23 February 2018



We're working with city leaders to encourage greater collaboration and integration between public sector, private sector and communities to enhance governance structures and ensure more informed oversight," says **Mallika Singh, Manager, KPMG Future Analytics, KPMG in Ireland.** "It often starts around a key reporting requirement like CSRD or as more of a grassroots initiative to enhance placemaking which then builds a common focus and language around the key governance issues."



Client story

The Netherland’s Johan Cruijff Arena ‘smart’ stadium

The Johan Cruijff Arena (JCA) is the largest stadium in the Netherlands and is the home base of AFC Ajax football club, the Dutch national football team, events, and concerts.

In 2015, the JCA began developing a digital marketplace as an innovative learning and development environment open to all. They wanted to create an environment where quick advancements and smart applications could be developed, tested, and brought to life.

KPMG in the Netherlands assisted the JCA in delivering a flexible data analytics platform to organize, share, and enable data analysis and a data governance framework, thereby helping to create an open data-driven innovation ecosystem to which anyone can join or contribute.

Through the collaboration with the KPMG team, the JCA can further strengthen its innovation ecosystem and develop applications that enhance the experience for stadium visitors. For example, stadium visitors can connect to the 55,000-seat stadium via smartphone for real-time directions that guide them directly from home to their seats. At the same time, state-of-the-art sensors monitor all aspects of the stadium — from the grass health to crowd movement — to help deliver the best and safest experience possible.

Today, the JCA has set the ambition to be net positive by 2030, which increases the need for accurate data to drive decision-making and reporting. To support this goal, the JCA is enhancing its data infrastructure in collaboration with KPMG in the Netherlands, ensuring that the right data is accessible and effectively utilized.



Data-driven

It is difficult to overstate the importance of reliable, (near) real-time data for governance and oversight. From planning through to operation and renewal, data and evidence is central to good decision-making and critical to ensuring that citizens and users are getting the impact and value they expect from city assets and investments.

A consistent and transparent data governance framework will help other decision-makers and governance bodies provide better oversight and control.³¹ And it enables governments to provide more transparent reporting and monitoring of their activities and influence on outcomes.

Governance is evolving, however. Indeed, as some governance and oversight mechanisms become more automated, city leaders and infrastructure operators will likely want to focus on the quality and reliability of the input data and the models to ensure risks are being identified and managed appropriately — and to develop long-term visions that can better manage value, risk, responsibility and transition needs.

“Singapore’s GovTech initiative ensures that data is being harmonized at a central level. The focus isn’t on collecting specific data points, but rather on ensuring there are enough levers available to integrate the data upstream and downstream to drive value for citizens,” notes **Abhishek Dubey, Associate Director, Infrastructure Advisory, KPMG in Singapore**. “It’s this kind of harmonization that has underpinned the success of the country’s Singpass Digital ID program.”

³¹ Smart City Data Governance: Challenges and the Way Forward, OECD, Urban Studies, 13 October 2023

Case in point India’s SPVs

In India, cities’ choices about the composition of Special Purpose Vehicles (SPVs) draw on situated understandings of the role of stakeholders in implementing urban development projects and build on state-specific governance contexts in terms of how state governments and municipalities collaborate. For example, though the boards of directors of smart cities are led by senior bureaucrats, there can be differences in how the CEO position is operationalized within the SPV.

Pune Smart City Development Corporation Limited (PSCDCL) has followed the practice of having a CEO from the administrative services.

Pune’s inclusion of five political representatives, including the mayor, on the SPV’s board demonstrates PSCDCL’s assimilation with the city’s political ecosystem. This is enhanced by including the heads of various urban local bodies (ULB) departments into PSCDCL’s procurement committee, which is responsible for the technical sanctioning of the projects. This provides a channel for implementing projects that allows for transparent information sharing with the ULB, while retaining the autonomy and responsiveness of the SPV.

By leveraging the flexibility of the supply chain management (SCM) in the composition of the SPV’s board and in the choice of implementation agencies, Pune was not only able to respond better to their citizens’ needs, but also improve the capacities of existing agencies to sustain urban rejuvenation efforts beyond the SCM’s duration.

Source: Smart Cities: Promoting Urban Governance in India, World Economic Forum, October 2023



Enabling

Governance should be focused on enabling the vision, supporting outcomes and unlocking opportunities. Rather than creating an abundance of controls, regulations and reporting requirements, priority should be given to removing barriers and encouraging integration.

By helping to raise standards and focus stakeholders on shared outcomes, governance and oversight bodies can play an important role in driving key objectives towards modernization, digitization and decarbonization by improving the sharing of data, capabilities and best practices within their ecosystems. Barcelona, Paris and Reykjavik, for example, have appointed a local data chief; Vienna’s Data Excellence Strategy aims to break down data silos; and Seoul has developed data dashboards to centralize and visualize urban data across departments.³²

While governance and oversight must ensure that citizens are protected and receiving the impact and value they expect, they must also encourage innovation and value creation while being agile enough to adapt to rapidly changing expectations and technologies.

Spotlight on the G20 Global Smart Cities Alliance

Established in 2019, the G20 Global Smart Cities Alliance brings together business leaders, innovators and experts with city networks representing over 200,000 local governments to accelerate the adoption of cutting-edge solutions for pressing urban challenges.

The Alliance’s global network has produced more than a dozen model policies, practitioner guides and case studies to support cities as they advance climate resilience and sustainability, transparent and innovative governance, and safety and accessibility goals. Each tool is developed through the review of existing best practices of cities and other bodies, combined with expert consultation to address gaps based on insights, learnings and consensus.

The Alliance also helps to mobilize resources and expertise to assist cities in the adoption of these policies and help drive on-the-ground impact. Examples include leveraging open data to enhance public safety in Mexico, strengthening procurement practices to improving digital accessibility for vulnerable groups in Turkey and enabling privacy impact assessments to bolster public trust in Japan.

³² Smart City Data Governance: Challenges and the Way Forward, OECD Urban Studies, 13 October 2023

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The acceleration of model practices is achievable when multi-stakeholders collaborate to address real-life challenges. The dedication and involvement of partners like Microsoft, G3ICT, Fujitsu, Infosys, C40 Cities, Leading Cities and many others make a significant difference. The Alliance’s policies support a people-centric approach for smart cities and can be adapted within local context. They serve as a baseline incentive tool, enabling city leaders and other stakeholders to benchmark and advance their best practices towards targeted goals.”

Dr. Anu Devi, Lead, G20 Global Smart Cities Alliance, Centre for Urban Transformation, World Economic Forum



As a Lead at the Centre for Urban Transformation, World Economic Forum, Anu has led initiatives shaping best practices on sustainability, digital accessibility and security. Previously, Anu was a director and consultant working on urban IoT innovation, and led the smart strategy to inform the OPDC regeneration in London.



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Given that the vast majority of today’s buildings will still be standing in 2050, we need to not only consider how to build better new infrastructure, but also how we can be more sustainable and smarter with what we have. It’s a totally different mindset that looks at outcomes, urban and social dynamics, and at energy and material flows, not just at outputs. That requires an entirely different governance and stakeholder model and operating framework.”

Jorn Verbeeck

Independent urban and sustainability expert



Jorn is the former Net Zero Urban Program Lead for KPMG in Belgium and an independent urban and sustainability expert. With more than 20 years of sustainability experience in both public and private sectors and at a local and international level, Jorn helps decision-makers overcome urban-related challenges.



Q&A with Jeremy Goldberg, Director of Critical Infrastructure, Worldwide Public Sector, Microsoft

Q: You speak with a lot of city leaders around the world. What common characteristics do you see in the most successful smart cities?

JG: The most successful cities have been those that really focus on the people. They are working to educate and engage people right from the very beginning — articulating the benefits and opportunities that technology could bring to improve overall quality of life. At the same time, they are also sitting down with their residents to understand their needs and how technology could be used as a tool to improve their lives. That leads to better collaboration, a more informed community, a better understanding of the challenges they will face in the future and more impactful ways of solving them.

Q: How are cities taking advantage of technology to drive innovation?

JG: There’s a lot of focus on exploring and adopting new technology and just about everyone wants to talk about generative AI these days. But innovation isn’t just about having the latest technologies. You also need to have the right governance, best practices and capabilities to drive the type of outcomes that lead to more resilient, sustainable cities. It’s important that cities focus on that continuous improvement and adaptability to stay ahead of the big challenges that face cities – things like emergency events and climate-oriented issues in particular – to drive real resilience and sustainability within a city.

Q: What do you see driving smart city evolution in the future?

JG: I think the future is going to be very people-centered. What that means is on-demand, 24/7 government services, enabled by technology and focused on helping residents make decisions at whatever time is convenient to them. And technology is going to play a key role in that.



At Microsoft, Jeremy serves as the Americas Strategy Director for Cities and Urban Infrastructure. Prior to Microsoft, he was the Interim Chief Information Officer at the State of New York and also the Deputy Secretary for Technology and Innovation, where he led the state’s IT organization through the first wave of the COVID-19 pandemic in 2020. Before his role in New York State, Jeremy held technology leadership positions in the Mayor’s Offices of New York City, San Francisco, and San Jose, California.

Funding and financing





Integrated

Budget is scarce. But the list of priorities — both to maintain city services and to drive the modernization, digitalization and decarbonization of cities — is long. And most city authorities are limited in how and to what level they can tax their populations and businesses. New approaches and sources of funding will need to be applied.

Public-private partnerships will likely play a key role, particularly when developing assets and delivering services that have clear and reliable revenue streams. But a range of new monetization opportunities are emerging around the world (for example, using Green Bonds to pull forward the value of Carbon Credits to the development phase) and city authorities should be considering all their options through an integrated and focused lens.

By focusing on an integrated view of projects, funding options, core objectives and sources of investment (public, private, philanthropic and so on), city leaders can start to make clear decisions about where and how to invest their capital.



Cities are under pressure to deliver a massive amount of new critical infrastructure while maintaining and upgrading existing assets. Yet most public purses are already stretched to their limit and new sources of public funding are limited. Rather than trying to find new public money, the leading cities are those taking their destiny into their own hands to find new sources of funding and delivery mechanisms.



Cities often struggle with limited budgets, which makes it challenging to fund essential smart city projects,” notes **Lloyd Harriman, Urban Transformation Specialist/Fellow at the World Economic Forum and Manager Major Projects and Cities Advisory, KPMG in the UK.** “Developing creative funding and financing models, such as green bonds and public-private partnerships, is crucial to attract necessary investments.”

Client story

Greater Manchester: Creating innovative funding mechanisms

The City of Greater Manchester wanted to improve transport services across the region. But first they needed to find alternative financing models to support a GBP600 billion extension to the existing Metrolink light rail network, as well as a range of other regional transport projects of strategic importance.

Working with KPMG in the UK, the City of Greater Manchester and its stakeholders developed a series of innovative funding and financing packages that would deliver some GBP2 billion of investment into local major transport schemes.

It would become the first of the UK Government’s ‘Earn Back’ funding deals which allowed cities to earn back their investments into local transport provided the investments result in additional economic growth.



Data-driven

In part, this is about having the right data to make smart decisions to drive project prioritization and funding decisions with a clear view of what your city wants to achieve and the quality of life you plan to deliver. Evidence and data-driven insights must drive decision-making, not gut feel.

At the same time, data can be the key to unlocking new sources of funding and financing. We have helped cities to quantify the value uplift that would be created by the development of a new metro and then find creative ways to share in that value creation with property owners and businesses.

In some cases, simply being able to quantify an opportunity can drive private investment towards a problem; being able to quantify water leakage from city pipes, for example, could lead to an innovative arrangement where private sector players could share in the recouped revenue gains.

Enabling

Often, the best use of public funds is to create the right enabling environment to encourage private sector investment. This could take many forms. For some markets, this may mean investing in developing the right skills and capabilities to manage innovative funding programs and interact with sophisticated investors. This might include the development of a prioritized infrastructure pipeline, the development of PPP policies and governance or the modernization of tendering processes.

In other cases, this may come down to creating the right enabling technology and data ecosystem to encourage private sector players to thrive, innovate and invest. Rather than investing in developing more mobility capacity, for example, perhaps explore how opening transit data might lead to privately funded ideas that deliver a similar outcome (in this case, by reducing the need for new capacity).

Given the current funding gap facing most cities, private capital will need to be ‘crowded in’ to support the levels of capital investment that is required. That will require a mindset shift for many city leaders; enabling funding and financing sources means thinking outside the box, looking at city-owned assets or infrastructure that have the potential to generate a return and then monetizing those assets where it makes sense to do so.

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Inclusivity is central to creating a smart, sustainable city that will attract and retain residents while creating a thriving environment to work and live,” argues **Consolata Mutua, PMO Manager Infrastructure Advisory, KPMG in Africa**. “Many markets face a significant and expanding affordability gap, emphasizing the need for solutions that cater to a broad range of people, regardless of income and location.”

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Europe has been particularly active in creating new sources of funding and grants for Member States to enhance critical infrastructure, build capability and share ideas,” says **Dr. William Hynes, Managing Director, KPMG Future Analytics, KPMG in Ireland**. “What we have seen is that the projects that are the most successful at securing funding are those that focus on improving resilience — economically, socially and environmentally.”

Client story

Colombia — Enhancing financial sustainability in mass transit

Over the past two decades, Colombian cities have made significant strides in improving their transport systems. However, challenges persist, with many cities struggling with financial sustainability and insufficient municipal support for both operational and capital expenditures. These systems often face institutional and technical capacity gaps at the local level, resulting in inconsistent supervision, regulation, and enforcement of service standards.

To address these issues, the Ministry of Transport partnered with a Multilateral Development Bank to identify essential policy and financial reforms for the long-term sustainability of Integrated Transport Systems (SITMs). Steer Davies & Gleave Limited Sucursal Colombia, as the prime contractor, engaged KPMG’s International Development Assistance Services (IDAS) group through KPMG in Colombia to provide financial recommendations aimed at enhancing the resilience and sustainability of SITM systems in Colombia.

The KPMG team undertook a thorough diagnostic review of SITM systems, evaluating technical, financial, and institutional

aspects across three study periods: 2010-2019, 2020, and 2021. This analysis was based on data from the Multilateral Development Bank, the World Bank, the Ministry of Transport, and the SITM systems. The KPMG team also assisted the Ministry in examining international case studies of public transport systems that have successfully restructured or updated their technical, financial and contractual components to improve financial sustainability and service delivery.

Based on this analysis, KPMG in Colombia developed a set of urban mobility financial recommendations for inclusion in the 2022-2026 national government agenda. The implementation of these recommendations is anticipated to significantly enhance the effectiveness and sustainability of transport systems and stimulate increased private investment.

Building on this success, KPMG in Colombia, alongside Steer as the prime contractor, has been entrusted by the International Finance Corporation (IFC) with a new engagement. The task is to develop a business model analysis for the procurement and financing of a greener bus fleet in Bogotá.

This project supports TMSA, Bogotá’s BRT public transport system, in:

1. Identifying fleet requirements for the new infrastructure
2. Selecting the optimal combination of fleet technologies
3. Quantifying investment needs
4. Providing recommendations to establish criteria for the procurement process.



Q&A with Rebecca Evans, Director of Sustainability, City of Ithaca, New York, USA

Q: How have digital twins helped the City of Ithaca make better decisions?

RE: Working with Cornell University’s Environmental Systems Lab, KPMG in the US and AugmentCity, we’ve been able to create some great storytelling opportunities. On the one side, we’re generating some really valuable and detailed data to help decision-makers spot challenges and create smart policy. We’re also using the technology to make data really approachable and digestible for people who may not have deep technical skills in specific domains. That is creating a lot of new partnership opportunities for us as other collaborators look to layer additional data sets and research questions into the model.

Q: What types of things are you discovering with your digital twin?

RE: The Environmental Systems Lab’s initial model could predict energy loads in individual buildings. That helped us plan key aspects of our city’s decarbonization strategy. KPMG in the US and AugmentCity helped us layer in other key data like flood predictions which uncovered a number of important insights. For example, we could see exactly how flooding might impact our ability to deliver emergency services, how it might affect heat pumps in low-lying areas, and how it intersects with our mobility strategies and where to place chargers, for example. Interestingly, you don’t always know about a problem until you actually see it in the model.

Q: How will public expectations around smart cities evolve in the future?

RE: We recently held some focus groups to ask exactly that. Interestingly, the vast majority of the feedback was rooted in quality of life. It’s not about technology or even climate. What people really want is a better life. Frankly, if climate change didn’t threaten our quality of life, we probably wouldn’t care as much. I think what people really want is to be comfortable and to thrive socially, economically and physically. That looks and feels differently depending on the city and the culture, but ultimately it’s about delivering a better quality of life for people.



Rebecca Evans, Director of Sustainability for Ithaca, was instrumental in the adoption of the Ithaca Green New Deal (IGND). She led environmental advocates, oversees IGND projects, and champions the Justice50 initiative. With degrees in Environmental Science and Policy Ethics, she transitioned into climate planning in Richmond, VA. Later, she became Ithaca College’s Sustainability Coordinator, creating an educational webinar on COVID-19, racism, economic disruption, and climate crisis. She also serves on various non-profit boards, aiming to inspire change beyond Ithaca.



Recommendations





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Singapore's success comes down to three main things. They created a smart nation office that integrated their efforts from the start. They harmonized their data across the country through GovTech. And they set themselves a clear goal of enabling citizens by bringing government closer to the people. Integrated, data-driven and enabling.”

Deven Chhaya




Partner

KPMG in Singapore



Becoming more integrated, data-driven and enabling

If the priority is to become integrated, data-driven and enabling, where should city leaders be focusing? Based on KPMG professionals’ experience, here are five key components within each priority that should be in place as cities strive to move from smart to smarter.

	<div>Integrated</div>	<div>Data-driven</div>	<div>Enabling</div>
1	Unified vision: Your vision is the north star that guides the oversight and integration layers. It should be based on what makes your city different, the unique needs and desires of your citizens and your vision for the future.	Good data: Reliable, standardized, open (where possible), accessible and trustworthy data is key to making confident evidence-based decisions. Data should flow not only from government and city council sources, but also from private participants and citizens.	Culture change: Moving from a culture of delivery to one of enablement requires the public sector, private sector and citizens to think differently about their role and objectives. Without culture change, all other activities lose value.
2	Stakeholder ecosystems: Encouraging and supporting ecosystems of owners, solution providers and stakeholders across the city and the wider region facilitates co-creation, drives greater collaboration and creates pockets of innovation focused on the unique needs of your city.	Strategy and governance: The key to getting good data is to have a robust and holistic data strategy and approach to governance that enhances trust across the data value chain while leaving room for private players to create value for citizens.	Citizen centricity: Ultimately, the needs of the population (current and future) are what drives the vision and prioritization. Cities must therefore start with a clear understanding of what citizens want and can help deliver, as well as the mechanisms to remain on top of changing sentiments.
3	Technology and tools: At a decision-making level, this is about having a real-time and reliable view into the city’s strategic, operational and reporting data. At the operational level, it is about adopting the right tools to encourage collaboration and systems integration.	Security and resilience: Data security and privacy are always paramount and should be designed into all strategies and activities from the start. At the same time, a new bargain must be struck with citizens to trade a certain level of data privacy for value in city services.	A prioritized plan: Think of this as your vision broken down into achievable outcomes and milestones that set the priorities and recognize the interdependencies a cross various outcomes and stakeholders.
4	Collaboration organization: These are often SPVs or independent agencies that hold responsibility for integrating and orchestrating strategies, capabilities, activities and (often) investment across a portfolio of prioritized projects and initiatives.	Enabling technology: Cloud computing, analytics, artificial intelligence, compute power, connectivity — there are many technology components that must be in place to facilitate real-time data sharing and decision-making.	Policies and frameworks: Cities will need to ensure they have enabling policies, regulation and legislation to encourage private investment and the formation of public-private partnerships while remaining flexible to new technologies, providers and approaches.
5	Independent oversight: While this role is often played by city councils or commissions, the key here is to aim to ensure that citizen and policy requirements are aligned to the activities and objectives of the city and its stakeholders.	Tools and capabilities: Turning data into insights into value requires cities to develop a data-driven culture and evidence-based ways of working supported by key visualization tools and capabilities.	Monitoring and evaluation mechanisms: From citizen feedback mechanisms through to audit and evaluation processes, city leaders will need tools and processes to help them ensure that outcomes are being assessed and measured, achievements being realized and recognized, and that value is flowing to citizens.



Conclusion



It is in city halls, on city streets and in city business districts that humanity's destiny will be decided. Some cities will thrive under the pressure. They will become living, breathing entities where every voice is embraced, where cutting-edge technologies deliver superior quality of life, where every choice reinforces our commitment to sustainability and where every individual contributes to the city's evolving narrative.

The most successful cities will be those that take bold actions today to become more integrated, data-driven and enabling tomorrow.

As this report clearly illustrates, many cities around the world are making strong progress and there is an increasing body of knowledge and forums where cities, companies and citizens can come together to drive real outcomes.

We hope this report contributes to that spirit of collaboration, providing inspiration and insights to help city decision-makers, infrastructure leaders, citizens and companies accelerate their progress from smart to smarter.





Methodology



The research for this report aimed to explore the key factors enabling sustainable and resilient cities of the future. Our primary objective was to identify the critical challenges cities face today and how they can become more integrated, data-driven, and enabling to address these challenges effectively.

To achieve this, we employed a mixed-methods approach, focusing primarily on qualitative research conducted from May to August 2024. Several in-depth interviews were conducted with key stakeholders and experts in urban planning, sustainability, and technology. These interviews provided valuable insights and context to complement the secondary data collected from existing literature, industry reports, and government publications. Notable interviewees included:

- **Andrew Collinge**, Non-resident Fellow in AI Practice, Mohammed bin Rashid School of Government, who emphasized the importance of data sharing and collaboration.
- **Rebecca Evans**, Director of Sustainability, City of Ithaca, New York, who shared how her city is using digital twin technology to drive policy and community outcomes.
- **Jeremy Goldberg**, Director of Critical Infrastructure, Worldwide Public Sector at Microsoft, who offered insights on the success factors driving smart city development.
- **Joel Mills**, CEO of Offshore Simulator Centre and AugmentCity, who provided insights on the role of digital twins in urban planning.
- **Massamba Thioye**, Project Executive UNFCCC Global Innovation Hub at UN Climate Change Secretariat, who offered advice on using innovation to decarbonize cities.

- **Kristina Verner**, Senior Vice President, Strategic Policy and Innovation at Waterfront Toronto, who shared her expertise on community engagement and public acceptance.
- **Dr. Anu Devi**, Lead, G20 Global Smart Cities Alliance, Centre for Urban Transformation, World Economic Forum who shared an update on the G20 Global Smart Cities Alliance.
- **Jorn Verbeeck**, Independent urban and sustainability expert.

The organizations interviewed varied in size, from small enterprises to large multinational corporations, and included both private and public entities across multiple industries, including government, infrastructure, and transportation. Participants were drawn from various countries and regions, helping ensure a diverse and comprehensive perspective.

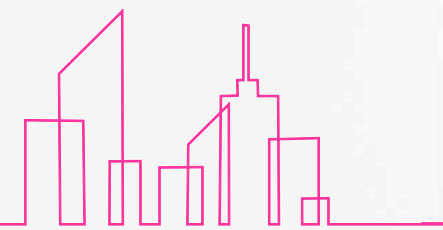
We conducted thematic analysis of interview transcripts and open-ended interview responses, identifying common themes and patterns. This analysis provided a deeper understanding of the key issues and helped us identify the most critical factors enabling sustainable and resilient cities.

We also reviewed existing literature, including academic papers, industry reports, and government publications. This literature review helped us contextualize our findings and identify gaps in current knowledge. We employed triangulation to ensure the credibility and reliability of our findings. This involved cross-verifying data from multiple sources, including comparing interview insights with secondary data to identify consistencies and discrepancies.

By combining qualitative insights with data analysis and triangulation, this report provides a detailed exploration of the factors enabling sustainable and resilient cities of the future.



How KPMG can help



From ideation, policy and planning through to operations, maintenance and renewal, KPMG’s network of professionals can help you move from smart to smarter at every stage of the project lifecycle. Our people work as part of a truly integrated multi-disciplinary ecosystem focused on helping cities deliver outcomes that support modernization, digitization and decarbonization to create better places and spaces for citizens around the world.

Projects lifecycle



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