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Global Smart City Partnership Program | WORLD BANK GROUP

GLOBAL SMART CITY PARTNERSHIP PROGRAM ENGAGEMENT GUIDANCE NOTE

KWPF Korea-World Bank Partnership Facility

Ministry of Land, Infrastructure and Transport

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Abbreviations

AI : Artificial Intelligent
ASA : Advisory Services and Analytics
AR : Augmented Reality
BSI : British Standard Institution
CPF : Country Partnership Framework
CPL : City Planning Labs
DD : Digital Development
DGRA : Digital Government Readiness Assessment
ENB : Environment and Biodiversity
FCI : Finance, Competitiveness, and Innovation
FCV : Fragility, Conflict, and Violence
GEMS : Geo-Enabling Initiative for Monitoring and Supervision
GOV : Governance
GP : Global Practice
GPURL : Global Practice for Urban, Disaster Risk Management, Resilience and Land
GSCP : Global Smart City Partnership Program
GSG : Global Solutions Group
GTMI : GovTech Maturity Index
ICT : Information and Communication Technology
IFC : International Finance Corporation
IoT : Internet of Things
ISO : International Organization for Standardization
ITS : Intelligent Transport Systems
ITU : International Telecommunication Union
KCN : Korea City Network
KIDS : (Disruptive) Knowledge, Information, and Data Services
MIS : Management Information Systems
ML : Machine Learning
MOLIT : Korea Ministry of Land, Infrastructure, and Transport
MSDI : Municipal Spatial Data infrastructure
OECD : Organisation for Economic Co-operation and Development
PPP : Public-Private Partnership
RAS : Reimbursable Advisory Services
SSI : Social Sustainability and Inclusion
UAV : Unmanned Aerial Vehicles
URL : Urban, Disaster Risk Management, Resilience and Land
VR : Virtual Reality
WBG : World Bank Group
WSP : Water and Sanitation Program

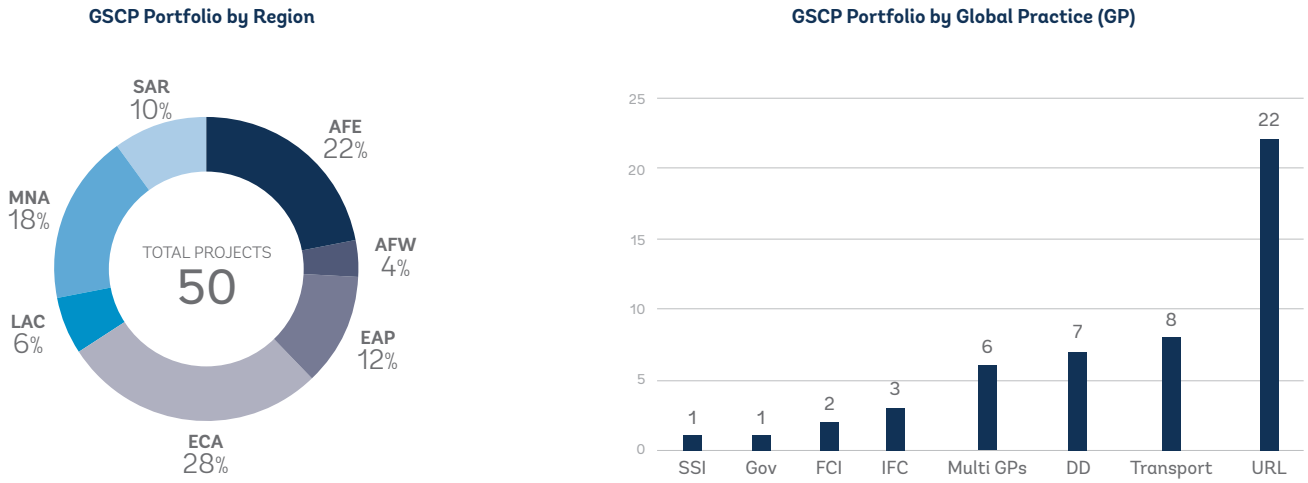
1 Introduction

This note is developed to guide the World Bank Group (WBG) teams in their policy and investment dialogues with the clients on smart cities. It introduces the key features, building blocks and development pathways of smart cities, presents WBG engagement types and challenges, and proposes opportunities for WBG support and priority actions.

The note has emerged from the implementation experience of the Global Smart City Partnership Program (GSCP).[1] The program was launched under the Global Practice for Urban, Disaster Risk Management, Resilience and Land (GPURL) in 2018 and through a strong partnership with the Republic of Korea as one of the leading countries of smart city development. The program objective is to introduce and mainstream the smart city agenda in WBG client engagement and investments by facilitating an integrated and innovative approach to urban development across sectors.

Over the past five years, the program has provided demand driven technical advisory services to various WBG teams and clients on smart city good practices and solutions. Thematic and regional share of the GSCP portfolio combines Phase 1 of 2018–2021 and Phase 2 of 2021–2023 (figure 1.1). Thematically, they include the departments of Urban, Disaster Risk Management, Resilience and Land (URL), Digital Development (DD), Governance (GOV), Transport, Finance, Competitiveness, and Innovation (FCI), Social Sustainability and Inclusion (SSI), and International Finance Corporation (IFC).

Figure 1.1. GSCP Portfolio of smart city engagements by region and global practice.



Note: AFE: Eastern and Southern Africa; AFW: Western and Central Africa; EAP: East Asia Pacific; ECA: Europe and Central Asia; LAC: Latin America and the Caribbean; MNA: Middle East and North Africa; SAR: South Asia; AGF: Agriculture and Food; DD: Digital Development; FCI: Finance, Competitiveness, and Innovation; Gov: Governance; IFC: International Finance Corporation; URL: Urban, Resilience, and Land.

Although by no means covering the full scope of WBG engagements, GSCP portfolio of 50 projects enabled the identification of a smart city engagement typology and shared challenges. This opened an opportunity to explore a common approach to address some of the key challenges.

The note draws from GSCP implementation experiences, which includes technical assistance to WBG engagements on smart cities and knowledge sharing on frontier technologies and innovation. This is complemented by an extensive desk review of other guidelines, toolkits, indicators, policy, research work and case studies that are available within and outside WBG.

GSCP portfolio of all 50 engagements is presented in Appendix A and analyzed further in Section 3, with the difficulties and successes the program has observed in WBG smart city engagements over the years. This guidance note will propose how to address common challenges and capitalize on opportunities (Section 4), using GSCP and other country or city engagements as examples of what has worked and can be replicated and what common challenges are, and how they can be addressed. Section 5 presents a collation of WBG initiatives that are relevant for smart city development as bases for facilitate cross-sectoral collaboration. Section 6 concludes the note with suggestions for WBG smart city engagement.

1.1 Objective and target users

Guide WBG teams interested in engaging clients on smart city development, by providing GSCP understanding of, and experience with, smart cities. Propose a common approach to addressing key challenges and improve the impact and sustainability of smart city investments.

Guide GSCP experts to arrive at a common understanding of, and adopt a standard approach to, smart city development in their support to WBG teams and clients.

GSCP is a support program primarily for WBG teams who mobilize and leverage financial, technical, and other resources to provide advisory services to policy dialogue with clients and their investment design and implementation. The immediate target audience of the guidance note will be WBG teams that are supported by GSCP now and in the future. The benefit of the guideline can extend beyond the program to wider WBG teams who are interested in smart cities.

GSCP has mobilized smart city experts to support selected WBG teams. GSCP experts play a critical role in introducing the concept of smart cities, shaping client demands, and providing technical advice on feasible interventions. The guidance note will help GSCP experts better understand the needs of both WBG teams and clients and expedite and scale up their support by applying a standard approach to smart city engagements, thereby improving the overall performance of the program.

What this guidance note is not…

There has been a long-standing call for a practical guideline that can help developing countries plan and build smart cities. GSCP has frequently received such requests from WBG teams and clients. However, considering how smart cities are loosely defined, developing a guideline that is universally applicable to a wide range of contexts is a challenging task. This note is therefore more for guiding WBG teams to better structure their smart city engagements than for directly helping developing countries and cities with a step-by-step guide on how to develop smart cities.

What this guidance note is…

Instead, the note focuses on how smart city approaches can be localized and implemented in developing countries, the importance of which gets a near universal emphasis in the literature. Smart city development requires the national government play a critical role in setting the agenda, prepare the institutional and regulatory environment, invest in digital trunk infrastructure, and both incentivize and support cities technically and materially. This note introduces a few WBG initiatives that are more targeted at the national level but ultimately takes the perspective of how city governments can use data and digital technologies to plan and manage urban functions in a smart way.

1.2 How this guidance note can grow further

The guidance note intends to help WBG teams frame their engagement with the clients on smart cities, locate it on a broader landscape of smart city development and navigate available resources and other engagement cases as initial set of resources. This can be complemented by bespoke, hands-on support from smart city experts, for example, through a program like GSCP. Of WBG engagements, the guidance note focuses mostly on World Bank project design and implementation. The IFC Smart City Toolkit that was developed in 2022 can better guide IFC business development.

This guidance note is a living document that can be updated with more GSCP and other WBG experiences. Future engagements under the next phase of GSCP starting in July 2023 will test the utility of the note by actively applying the key concepts and approaches in the note in engaging with WBG clients. This will be a steppingstone to prepare a guidance note for developing countries and cities eventually—which will be a medium term project in the future phase of GSCP.

Notes

1. https://www.worldbank.org/en/programs/global-smart-city-partnership-program

2 Smart City Model

This section presents the basic concept of smart cities with their key characteristics as observed by GSCP and in global discussions on smart cities. The section introduces key building blocks of smart cities, composed of digital and nondigital elements that are necessary for a city to plan and manage its core functions across sectors in an integrated, optimized, and potentially automated manner. The section also discusses how smart cities can evolve over time through the interaction between top–down and bottom–up initiatives as well as across different sectors within a city.

2.1 Key characteristics

'Smart city' is a widely used term but has no universally agreed upon definition. Being open to interpretations, the term has both inspired people's imagination and created disappointments.[1] Excitement arose over the reach of digital revolution in being a driving force of the smart city agenda, but questions remain regarding what it has delivered in practice. Over time, the earlier emphasis on the application of advanced, frontier technologies[2] has shifted more to a holistic, people-centered approach to smart cities (UN Habitat 2022). Yet, a good amount of tension and confusion remains in smart city discussions, particularly given the wide gap between the global technology advancement and the digital reality of many countries.

Various institutions have defined the concept and Appendix B presents a few selected examples to show the extensiveness of the concept and highlight some shared features. The lack of an operational definition has led to a range of urban initiatives being labeled under the umbrella term of a smart city, while smart city guidelines and indicators have proliferated, making it difficult to set clear smart city goals, plan implementation, and measure progress and impact.

Common elements across smart city definitions are effective use of information and communication technology (ICT) for innovation of city operations and public services and integration of physical, digital, and human systems. The working definition that GSCP has utilized over the years3 captures them well and this guidance note will continue to use it.

> **A city that makes the best use of data, digital technologies, and other resources to improve city planning and management, service delivery, citizen engagement and accountability.**
>
> Smart City White Paper, 2018.

Observations from GSCP implementation and in the smart city literature bring realism to the definition by highlighting some of the key features of smart cities.

Smart cities embody a city vision. Smart city definitions almost invariably envision "betterment" as its mission. For instance, (i) deliver better services and quality of life to residents, businesses and visitors in the city, now and for the foreseeable future, without unfair disadvantage of others or degradation of the natural environment by the International Organization for Standardization (ISO); (ii) improve quality of life, efficiency of urban operation and services and competitiveness by the International Telecommunication Union (ITU); and (iii) boost citizen well-being by Organisation for Economic Co-operation and Development (OECD). Although these city visions are universal, how to achieve them is the more important question and often context specific.

"Smartness" of cities comes from using data and digital technologies for achieving city visions. Smart solutions are not always data driven and digitally enabled, for example, as with low cost, and low carbon construction materials, and nature-based solutions to flooding and other natural hazards. Different interpretations of "smartness" sometimes create confusion, for example, when equating smart cities with climate smart cities.[4] For conceptual clarity, this note considers the use of data and digital technologies as an essential feature of smart cities.

Digital technologies include both basic and fast evolving technologies. Sets of interrelated technologies have come so far in two waves.[5] However, many cities in developing countries are grappling with the first wave of basic technologies yet.

- The first wave of digital technologies has been characterized by the reengineering of government and business processes through development of databases, and e-government and e-business applications.
- The second wave of technologies generates and integrates data from all types of sources—big data, sensors, digitized transactions, open government data, and instrumented urban infrastructures and systems—and then applies analytics and artificial intelligence (AI) to detect patterns and make decisions.

Data and digital technologies add value by enabling an integrated approach to urban development. Integration is a crucial expected outcome of smart cities. The ultimately envisioned model of smart cites is that of cities planning and managing their functions in an integrated, optimized, and automated manner through effective use of data and digital technology. In this regard, smart cities are both processes and outcomes of integrating city functions, whereby physical, digital, and human systems in the built environment are effectively integrated to facilitate collaborative, multistakeholder engagements.

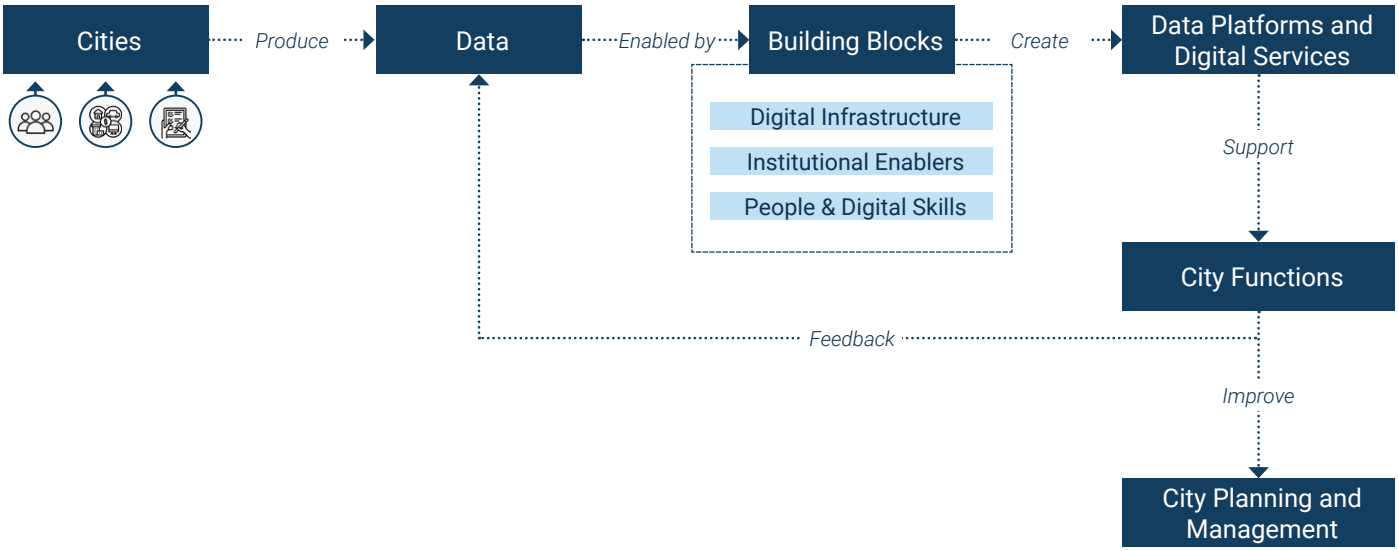
Smart city development involves both strategic planning activities and data driven and digitally enabled city solutions. A plethora of smart city strategies exist that embody city visions. Berger (2019) finds that 153 cities had officially published a smart city strategy, of which only eight were implemented at an advanced stage. At the other end of the spectrum, a multitude of problem or sector specific smart solutions are available. WBG smart city engagements also fall into these two categories—strategic planning and smart solution development—and connecting the two remains a challenge in smart city development as well as in WBG support (see Chapter 4).

With these core features of smart cities, this guidance note focuses on operationalizing the smart city concept. First, it analyzes how cities have utilized data and digital technologies to achieve their goals and the challenges encountered in advancing their smart city agenda. Subsequently, it explains how cities can address some of the challenges and what WBG can support. The following sections present a smart city model with common elements and development pathways to frame various smart city engagement experiences.

2.2 Building blocks

Smart cities require several underpinning elements as prerequisites for advancing digitization, digitalization, and digital transformation of specific city functions and a city as a whole. They are data, digital infrastructure, institutional enablers, and people and digital skills. Cities generate numerous data on people, assets, and activities. Adequate digital infrastructure, enabling institutions and people with solid digital skills allow cities to effectively collect, process, and manage data as a basis for providing digital services can improve and innovate a wide range of city functions (figure 2.1).

Figure 2.1. Smart city model for integrated urban planning and management.



For example, mobile phone-based money transfer services such as M-PESA in East Africa dramatically increased access to financial services, with relatively low digital infrastructure and technology requirements. An integrated fare collection system in Seoul, Republic of Korea, using T-Money card, for which multistakeholder coordination was more important than system development, enabled the Seoul Metropolitan Government to collect extensive mobility data and produce sophisticated transport and other data analytics.

Data are foundational for smart cities and pivotal to city planning and management. Data include both more traditional, static data such as census or survey data, and more dynamic, real-time data—for example, satellite imagery, data collected by drones and from sensors. Generating insights from data requires not only technical but also institutional and human capability to manage and process data effectively and responsibly—a robust data governance policy and regulation and system architecture.

Digital infrastructure is a broad-based concept that encompasses connectivity, Internet of Things (IoT)[6], data repositories, and associated digital technologies. Its coverage and quality can determine the type and level of technologies available for smart solutions. Advanced ICT infrastructure allows cities to utilize IoT with an enhanced ability to remotely monitor, manage, and control devices to generate new insights and actionable information from massive streams of real-time data (Kim, Ramos, and Mohammed 2017). On the other hand, the digital potential of many cities is still hampered by limited availability or low quality of basic digital infrastructure such as unstable electricity and internet access.

- Connectivity: Broadband network, internet access
- Internet of Things (IoT): Mobile devices, computers, sensors
- Data repositories or information systems[7]
  - Systems to collect and store data digitally with data analytics functions
  - Systems that function on computer-generated data such as machine learning (ML) and artificial intelligence (AI).
- Digital technologies can be grouped in two: basic and advanced—or the first and second waves mentioned earlier. Basic technologies support data collection and sharing, while advanced, disruptive technologies enable data analytics that: (i) transform relationships between the government, private sector, non-profits, communities, and citizens; (ii) generate synergies and support interoperability across city domains; (iii) and drive innovation, for example, through open data, hackathons, living laboratories and tech hubs (European Union 2014).

Institutional enablers are nondigital but equally critical elements for cultivating an integrated approach to urban planning and management, which are necessary for, and reinforced by, effective use of data and digital technology. An enabling environment for a collaborative and innovative way of working requires adequate policies and regulations, shared vision and strategy, and strong leadership and governance—protocols, standards, and roles and responsibilities.[8] Cities also need viable and creative business models and open and interactive governance to engage the private sector and citizens.

- Policies and regulations: Data or system standards; cyber security, and data privacy
- Shared vision and strategy: Digital strategy, urban strategy, and economic strategy
- Leadership, governance, and institutions
- Business model and finance as a framework to grow and partner with digital start-ups and established businesses

People and digital skills ultimately define the vision and pathway of smart city development. Technically, the level of digital skills and capabilities in public, private, and civic sectors affect the feasibility of technological options. More broadly, the vision of smart cities has evolved to enable citizens to access, understand, and utilize data, algorithms, and other knowledge resources that are essential for decision making and public services (UN Habitat 2020). By facilitating citizens' active participation in co-design, building, and operation of smart cities, and equipping them with adequate digital capabilities to adopt smart technologies (World Bank 2021), smart cities can successfully provide services that people want or need in a user-friendly way and therefore enhance their wellbeing.

- Citizen participation, co-creation: Smart city labs, social media, and crowd sourcing
- Digital capabilities: Digital literacy, ICT, and cybersecurity skills
- Data analytics capability to extract insights from data
- Digital entrepreneurial or business skills.

The smart city building blocks draw largely from the World Bank's digital economy framework (box 2.1) and are aligned with the institutional arrangements, people, data, and systems (IPDS) framework of the City Planning Labs (CPL) (box 2.2). Both frameworks support improvements on each building block and their interconnectivity to form a strong foundation for creating the dynamic digital economy or developing a municipal spatial data infrastructure (MSDI) to support data-driven urban planning. For smart cities, this guidance note equally focuses on strengthening the building blocks, more as a basis for developing smart solutions that serve various functional needs of cities.

When such sectoral solutions evolve on their own and in an integrated manner, overall city planning and management can become smarter. The section below describes different pathways through which digital advancement of each sector can be coordinated and interlinked toward the advancement of smart cities (Section 2.3).

Box 2.1. Digital Economy Pillars

The World Bank's digital economy framework consists of six pillars: digital infrastructure, digital skills, digital platforms, digital financial services, digital business, and trust environment. Each pillar is briefly described below as well as how it is repurposed as the smart city building blocks.

- *Digital Infrastructure* consists of connectivity (such as with high speed internet and internet exchange points), internet of things (such as with mobile devices, computers, sensors, voice-activated devices, geospatial instruments, machine to machine communications, vehicle to vehicle communications), and data repositories (such as with data centers and clouds).
- *Digital skills* Constitute technology skills, together with business skills to build or run a digital start-up or enterprise.
- *Digital platforms* offer products and services, accessible through digital channels, such as mobile devices, computers, and internet, for all aspects of life.
- *Digital financial services* refer to digital means for paying, saving, borrowing, and investing. It makes sense to have them as a stand-alone pillar of the digital economy framework, but they are merged with other city functions in the smart city model.
- *Digital business* includes digital start-ups and established digital businesses. They are important actors of smart cities but are not singled out as a building block in this guidance note as it takes primarily the government's approach to smart city development. Instead, a city's business model or framework to partner with digital businesses is included as part of institutional enablers.
- *Trust environment* refers to a governance framework balancing data enablers and safeguards, and supporting digitalization while protecting the individuals, businesses, and institutions from cybersecurity risks. This is incorporated as part of the broad-based institutional enablers for smart city development.

Source : http://www.worldbank.org/en/programs/de4lac/digital-economy-framework

Box 2.2. City Planning Labs IPDS framework

The City Planning Lab (CPL) supports cities with data-driven planning by developing and operationalizing a robust municipal spatial data infrastructure (MSDI). MSDI is a platform to organize, share, and leverage geospatial information to promote sustainable urban development. In pursuing its mission, CPL structures its engagement using a four-pillar IPDS framework that comprises:

- *Institutions:* Refers to the capacity of cities to develop and sustain formal policies, regulatory and governing structures that support geospatial-related activities, and to the role of the city government in fostering the growth of the broader geospatial ecosystem.
- *People:* Refers to creating an awareness of capacity needs and identifying gaps in human resource supply concerning geospatial skills. It addresses the skills gap in the production, maintenance, and utilization of spatial data.
- *Data:* Refers to the prevailing state of affairs on data availability, policies regarding formats, analysis, and sharing of geospatial information. This diagnostic also considers the business case for investment in data and the extent to which geospatial information can add value to existing city agency key performance indicators (KPIs).
- *Systems:* Refers to software, hardware, and physical information technology (IT) related infrastructure required to support MSDI. A key component lies in the adequacy, functionality, and user interface of the city- evel geoportals that combine geographic information system (GIS) and spatially referenced tabular data.

The IPDS framework offers holistic guidance to develop and operationalize MSDI, while also serving as a set of modular elements that cities can explore to create quick wins in the process. Developing an MSDI roadmap entails three key steps: obtain stakeholder consensus, identify opportunities and recommendations, and finalize the roadmap. These steps resonate well with GSCP's experience supporting municipalities envision smart city development and establish a strategic plan.

CPL provides a set of diagnostic tools to build consensus, such as the rapid MSDI readiness assessment, geospatial prioritization survey, and deep dive MSDI capacity assessment. These assessments help cities characterize their IPDS level. The IPDS framework also guides the identification of opportunities and recommendations, whereby the aim is to produce a list of actions to leverage or improve four enablers. Finally, the roadmap consolidates the priority actions and fits them into different time horizons (e.g., short, medium, and long-term).

Source : https://collaboration.worldbank.org/content/usergenerated/asi/cloud/attachments/sites/collaboration-for-development/en/groups/city-planning-labs/documents/jcr:content/content/primary/blog/_manual_cpl_municipalspatialdatainfrastructure-2Rxa/MSDI_Manual.pdf

2.3 Development pathways

Any city can be smart or become smarter in realizing its vision, using data and digital technology at different levels of sophistication. However, when the vision is to reach the high level of automated city management that provides optimal services to citizens and enlarges space for their participation, smart city development is certainly a long term, multisectoral process that requires integration of city functions institutionally and digitally.

Top–down and bottom–up approaches

This long-term process can benefit from a top–down approach whereby national governments provide a strategic guidance and coordinate various actors. A nationwide or citywide strategy for smart cities, backed by strong leadership, can serve as a roadmap that sustains and integrates sectoral initiatives over a long period of time. The Republic of Korea's smart city journey illustrates this well, wherein the national government's leadership was pivotal to prepare an institutional environment for smart cities (box 2.3). The case also underlines the role of the government in promoting public–private partnership (PPP) and innovation.

Box 2.3. The Republic of Korea's smart city development journey: Institutionalization and innovation

As an early adopter of the smart city agenda, Korea Rep. has experienced both opportunities and challenges of smart city development. Over the course of two decades, it has gone through the phases of smart city conceptualization, institutionalization, and innovation. The early implementation phase of smart city projects, known as "ubiquitous city" or "u-City" projects in the early 2000s, faced unexpected challenges for a variety of reasons. It included the absence of a basic technical and institutional framework to serve as the foundation for sustainable maintenance and operation of the implemented projects and provide a solid groundwork for innovation.

Drawing on lessons from the u-City projects, the Government of Korea Rep. began laying the groundwork to institutionalize smart cities by stipulating laws and regulations, establishing institutions, and defining potential enablers. The central government officially embraced the new concept of a smart city, which was technically defined as a platform, and holistically created a new form of integrated urban governance. To this end, the Special Act on the Construction of u-City, Korea Rep.'s first smart city law, was enacted in 2008, and the first national comprehensive plan for smart city implementation was developed in 2009.

In accordance with the law, local governments were mandated to formulate and submit their smart city plans to the Ministry of Land, Infrastructure and Transport of Korea Rep. for approval before officially launching individual projects both greenfield and brownfield. In addition to better organizing the government's own institutional setting, Korea Rep. has established public–private consultation systems to review and develop the national strategy for smart cities. The disruptive technology paradigm also changed the way cities operate beyond improving existing services. Open public data enabled private companies to provide public services on their own platforms, and the analytical activities performed by citizens allowed the government to deliver services proactively.

Source: Hwang, Jong Sung; Heo,Yoon Ju; Han,Ahram; Hwang, Jun Seok; Ju,Bora.

Smart Cities in the Republic of Korea : A Journey Toward Institutionalization and Innovation (English). WBG Korea Office Innovation and Technology Notes Washington, D.C. : World Bank Group. http://documents.worldbank.org/curated/en/099501509212220541/IDU09bc4586900d9a047080a9de0afa91af324a9

Various smart solutions also emerge bottom–up, using data and digital technology to address tangible challenges, often sector specific but sometimes multi-sectoral. In the absence of a comprehensive smart city strategy, cities may still invest in smart initiatives without recognizing them as part of smart city development. Such initiatives can become catalysts for shaping up the top–down approach if their

impacts are transformative and widespread. Singapore's journey toward a smart nation is a good example of how smart interventions in various sectors have eventually led to development of smart city masterplans and agencies (box 2.4).

Box 2.4. Singapore's journey toward a smart nation

Singapore's digitization of information started in the 1960s and was followed by computerization of the civil service and the private sector in the 1980s. The advances were accompanied by the continuous expansion and improvement of connectivity infrastructure in the 1990s onward. Since the 2000s, the provision of digital services by the public and private sector has accelerated and the establishment of key institutions has facilitated it further, for example, Government Technology Agency in 2016 and Smart Nation & Digital Government Office (SNDGO) under the Prime Minister's Office in 2017, which also led strategic national projects.

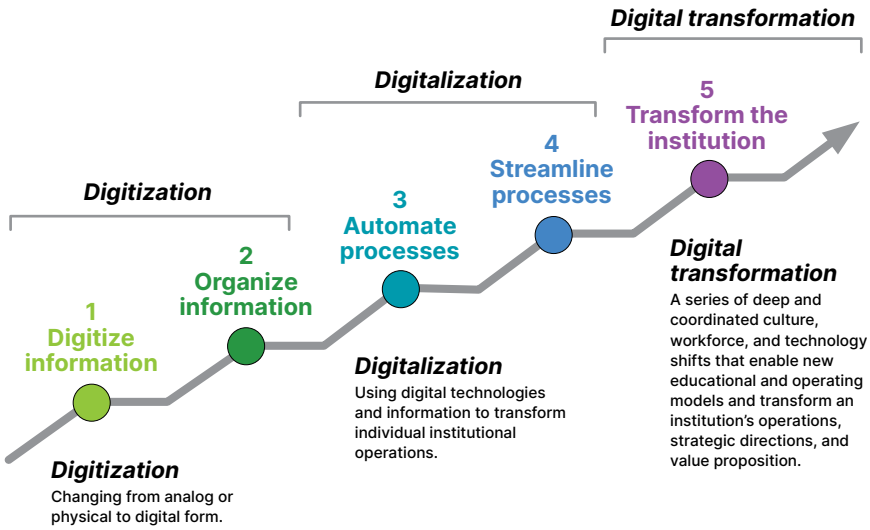
Source : https ://www.smartnation.gov.sg/about-smart-nation/our-journey/milestones/

This top–down, bottom–up process typically oscillates over time as the interdependent nature of city systems brings different stakeholders together to raise new performance issues that emerge in other domains and pay attention to new capabilities, targets, or policies. The strategic planning process upstream will typically address the interdependencies that exist within and across city infrastructure and service domains and will aim to enhance the crosscutting institutional and digital enablers. Investments downstream tend to target one specific challenged domain in a city, but as interventions advance, or scale-up, it impacts other city systems whereby the interdependencies need to be better addressed and the enabling environment should be improved holistically.

Digital pathway toward city transformation

Assessing where a city is at in its overall development journey toward digital transformation and forecasting what may occur next is complex. In practice, understanding each sector's digital trajectory is an easier first step to assess the direction of smart cities than evaluating the digital readiness of a whole city. Since city governments are usually organized by functions, it helps to understand that smart city development also takes place across different sectors, each of which is undergoing the process of digitization and digitalization, toward digital transformation (figure 2.2).

Figure 2.2. Digitization, digitalization, and digital transformation.



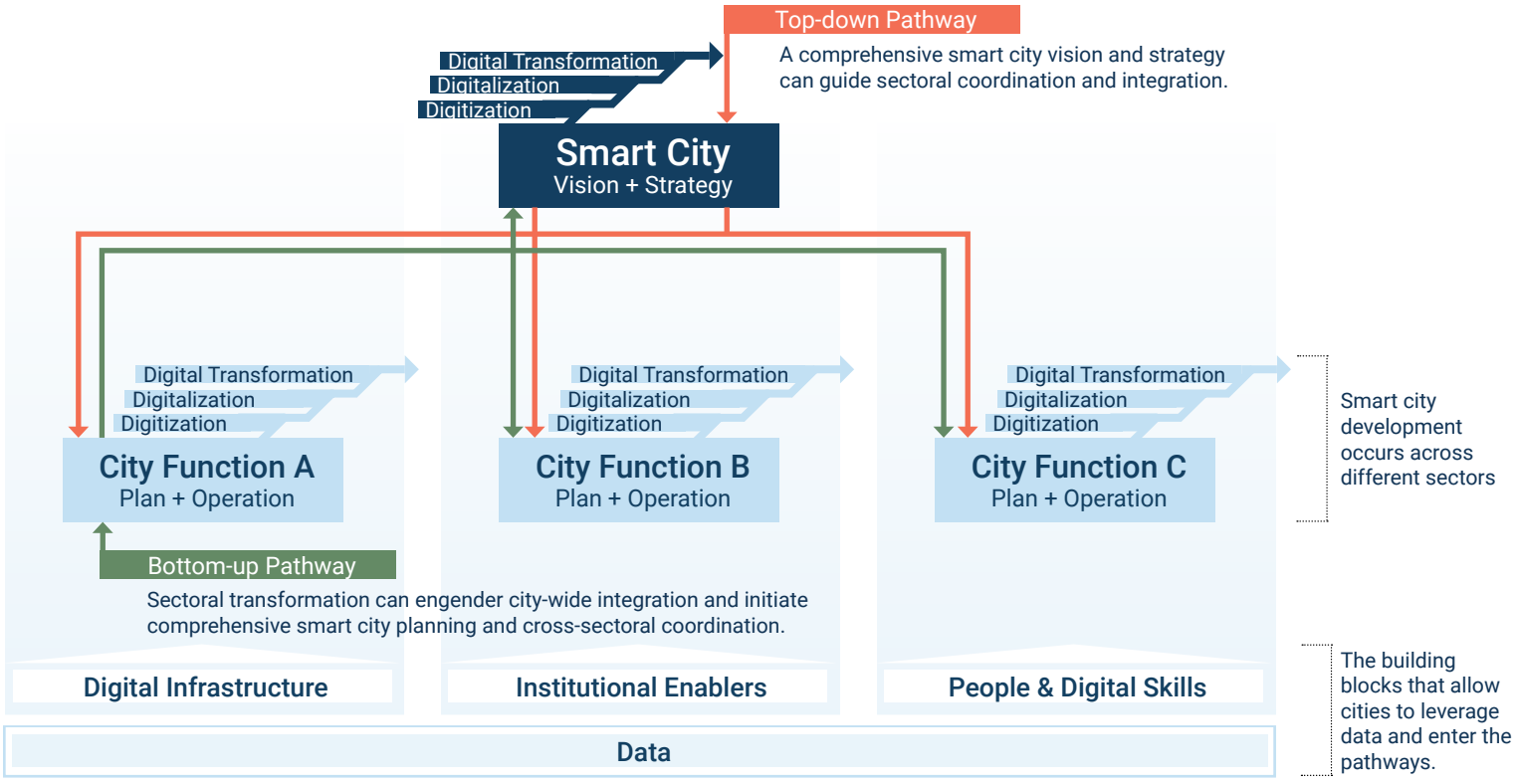
- Digitization: Encoding analog information into zeroes and ones for computers to store, process, and transmit as data.
- Digitalization: Process of employing digital technologies and information to transform business or governance operations and processes.
- Digital transformation: Citizen-driven strategic business transformation that requires crosscutting organizational change toward interoperability and cross-sectoral collaboration.

Source: Betsy Reinitz (2020). Consider the Three Ds When Talking about Digital Transformation. https://er.educause.edu/blogs/2020/6/consider-the-three-ds-when-talking-about-digital-transformation

Many WBG projects in GSCP portfolio are still at various points between digitization and digitalization, absorbing the first wave digital technologies, such as the e-government, government databases and networks, and government process reengineering and digitization, and the development of analog complements for these technologies.[1] Advancing through digitization and digitalization therefore continues to be an important area to support, not only because it is the digital reality of many countries and cities but also because true transformational potential of digital technologies can be realized when digitalization in each sector is evolving and maturing first and eventually interconnected with other sectoral digitalization efforts (figure 2.3).

Digital transformation is a crosscutting, multisectoral phenomenon, which requires not only digitalization in each sector but also interconnected digital infrastructure, platforms, and services at the city scale. While sectoral digitalization can improve the efficiency of specific city functions, the system of interconnected systems can support coordination and innovation of city planning and management, which will likely have more profound and lasting impacts (OECD 2021). Innovation in particular needs both technological advancements and a broad-based stakeholder participation in new, open, dynamic ways. This note views a smart city as a city where sectoral digitalization is well coordinated and creates synergies, notably through automated sharing of data and connection of business processes, a city can move toward digital transformation.

Figure 2.3. Smart city development pathway.



Source: Authors' own creation (2023).

Since digital integration is critical for city transformation, it is easy to equate a smart city with the highest level of technological development realized in an urban form as often depicted by futuristic images of smart cities. This is a view adopted by a technology-driven approach—the higher the automation of infrastructure and service delivery through digital technologies is, the smarter a city is. This note acknowledges that smart city development is also a process whereby cities and their citizens are becoming and feeling smarter, with an aide of data and digital technologies. That is, the key question for smart cities includes how digital technologies can transform outcomes, and more impactfully, how they enable broader city functions to transform—that is, the change of individual and institutional behavior and culture toward city visions. With this view, this note emphasizes the importance of institutional and human capacity improvements for effective use of data and digital technologies, as in any other developmental processes.

Notes

1. IMD: Smart City Piano and Smart City: Six Steps to Successfully Transform Your City (downloadable versions are at: https://www.imd.org/news/updates/smart-cities-swisscom-and-imd-partner-again-to-help-cities-digitize/)

2. Certain definitions of smart cities reflect this early emphasis on digital technology. For example, IBM notes: "Smart city has digital technology embedded across all city functions and systems, and the data generated from sensors and digital transactions are shared and used to optimize resource management and inform policy and decision making." (Smart Cities White Paper, 2018)

3. Hanna, N. K. 2018. Smart Cities: How Can the World Bank Help Cities Become Smarter? (unpublished)

4. Climate-smart cities are those on low carbon, resilient urban development pathways by planning for and investing in clean air, green spaces, well managed waste and energy services, comfortable commutes, and access to safe, resilient, and green buildings. Source: Carter and Boukerche. 2020. Catalyzing Private Sector Investment in Climate Smart Cities.

5. Brynjolfsson and McAfee, 2017, in the Smart City White Paper (2018).

6. IoT refers to the network of physical objects that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems.

7. According to City of Toronto, digital infrastructure includes all technology assets that create, exchange, or use data or information in a digital form as part of their operation, as well as all data collected or used by the aforementioned technology assets. Technology assets in this definition include physical objects, software systems, fixed and mobile devices (computers, digital kiosks, robots, vehicles, and mobile phones) and data repositories.

8. The first pillar of a smart city – Institutional development, https://www.technology-innovators.com/the-first-pillar-of-a-smart-city-institutional-development/

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3 Smart City Engagement Experiences

This section presents GSCP engagements for the past five years from 2018 to 2023 and analyzes their patterns in view of the smart city model. The analysis will identify concrete entry points for WBG engagements as well as any gaps or areas for strengthening. Through seven rounds of call for proposals—Round 1 to 7—GSCP has supported 50 WBG teams in two main types of smart city engagement: smart city strategic planning and smart solution development. Smart city development can start from the national or city level strategies and move toward concrete investments (box 3.1). Smart city projects on specific sectoral challenges can contribute to build a foundation for smart cities (box 3.2).

- *Smart city strategic planning* is a process of developing a shared vision, strategy, and target. If effectively done, strategic planning can guide mobilization of human, technical, and financial resources, and implementation of various projects in a coordinated or integrated manner toward smart city development (see box 3.1).
- *Designing, developing, or improving digital solutions through WBG investments*, particularly in the context of World Bank lending. These solutions are mainly sector specific information systems or data platforms that can help improve the efficiency of city functions—traffic management, fare collection, housing market analysis, land administration and management, or urban planning—and transparency, inclusiveness, and innovation of public services—open data platform, citizen engagement or grievance redress platform, or city planning laboratory.

Box 3.1. Toward a smarter and greener Amman

Greater Amman Municipality (GAM) is ambitious in seeking to transform Amman, the capital and largest city in Jordan, into a smart and green city. GAM has taken some significant measures to achieve this vision, mostly focusing on transport related strategies and activities. GAM also has a competent governance structure with dedicated units and qualified staff to steer and execute a portfolio of smart city projects.

However, most smart city activities in Amman are limited to the planning stage. Solutions and systems developed so far are addressing specific problems within a sector. Moving from planning to implementation requires an integrated crossfunctional approach.

The WBG engaged with the smarter greener Amman agenda in 2021–2022, through GSCP support. GSCP experts ran eight virtual workshops with GAM, involving more than 100 staff members in total, resulting in a draft city transformation program, with two priority actions: (i) identifying where to implement Amman's Smart Neighborhoods, to demonstrate visible improvements through interventions such as an innovative mobility model and open space; and (ii) strengthening a digital foundation by developing a smart city platform with data and asset management functions.

GAM is committed to implement smart city plans developed through comprehensive consultations and with a list of priority initiatives and timeline. This in turn contributed to the WBG team's ongoing dialogue with Amman on a new lending operation that is under preparation.

Source: GSCP Phase 2 Engagement Brief (to be published in 2023).

Box 3.2. Using a digital twin and three-dimensional cadaster for smart land and infrastructure management in Indonesia

Indonesia's cadastral maps display land parcels, along with their associated legal rights, only in two dimensions (2D). This is inadequate for multilevel properties. A new method called "digital twin"—a virtual representation of a city's objects that allows dynamic analyses under simulated real-world conditions—can help Indonesia achieve its smart city goals and better manage complex assets, by defining property rights, restrictions, and responsibilities in three-dimensional (3D) space.

The World Bank finances the One Map Project that is designed to assist Indonesia's Ministry of Agrarian Affairs and Spatial Planning–National Land Agency (ATR–BPN) to conceptualize and develop a 3D cadaster mapping system and geospatial solutions based on a digital twin. The experts, mobilized by GSCP, participated in assessing the government's existing mapping systems and service delivery status, and its technical capacity. They identified needs through a bottom–up approach and assessed opportunities and constraints in relation to relevant global good practices. The second support phase focused on working with the government to develop business models for 3D cadaster and define a system architecture, boosting ATR–BPN's technical capacity.

ATR–BPN plans to demonstrate Jakarta's cadaster-based indoor–outdoor map services covering an area of 10 square kilometers. It is also considering public–private partnership models suggested by the project experts. Further, through GSCP facilitation, they are now selected for the Korea City Network (KCN) program by MOLIT and are receiving deeper technical assistance to scale up the effort under a follow-on World Bank lending operation.

Source: GSCP Phase 1 Engagement Brief https://thedocs.worldbank.org/en/doc/cc92982a5764e7a2bde421d357ae8db3-0090012023/original/Indonesia.pdf

Either for strategic planning upstream or investment design downstream, GSCP has supported a common set of activities that include technical assessments, stakeholder engagements, knowledge sharing through benchmarking, workshops, and knowledge exchange programs, in-person or virtual, and capacity development through on-the-job or systematic training, as well as one-off or regular mentoring and check-ins.

This section categorizes GSCP engagements into two types separately, considering that they are different in nature and scope. The former is more holistic, cross-sectoral, and strategic than the latter that tends to focus on sectoral issues and look for operational solutions. It should be noted that the mapping pertains only to what GSCP supported, which is usually part of a larger policy dialogue, analytical work, or investment project that WBG is involved in. Accordingly, the activities and outputs that GSCP supported do not represent, and may be different from, what the overall WBG engagement aims to produce and achieve. For example, GSCP supported the review of a technical design of an integrated fare collection system under a transport lending project, which will develop such system later.

Understanding the depth and breadth of WBG analytical and lending projects related to smart cities, whether having been supported by GSCP or not, requires a systematic WBG portfolio review, which is beyond the scope of this note and can be planned under the next phase of GSCP. Yet, GSCP engagements provide a useful window for WBG activities that are most smart city relevant. Insights from GSCP engagements will be discussed in Section 4.

3.1 Strategic planning

Smart city strategic planning is a process of bringing digital and urban strategies together by assessing digital potentials across various city functions and enhancing both digital and analog—institutional and human—dimensions of city management. This is less of a digitalization process, whereby the technicality of developing digital solutions for specific sectoral problems becomes the center of attention. Rather, developing a strategic plan typically entails an assessment of baseline conditions, gaps, and needs, across various city functions, which helps identify where a city is located within the digital development phases—digitization, digitalization, and digital transformation.

Assessment typically leads to an action plan or digitalization roadmap that will bring a city to the next level of digitalization and toward digital transformation through concreate guidance on relevant interventions, ideally through multisectoral, integrated designs. As for any city planning process, key success factors for smart city strategic planning revolve around institutional enablers that facilitate a cross-sectoral, whole-of-the-city approach.

Key processes

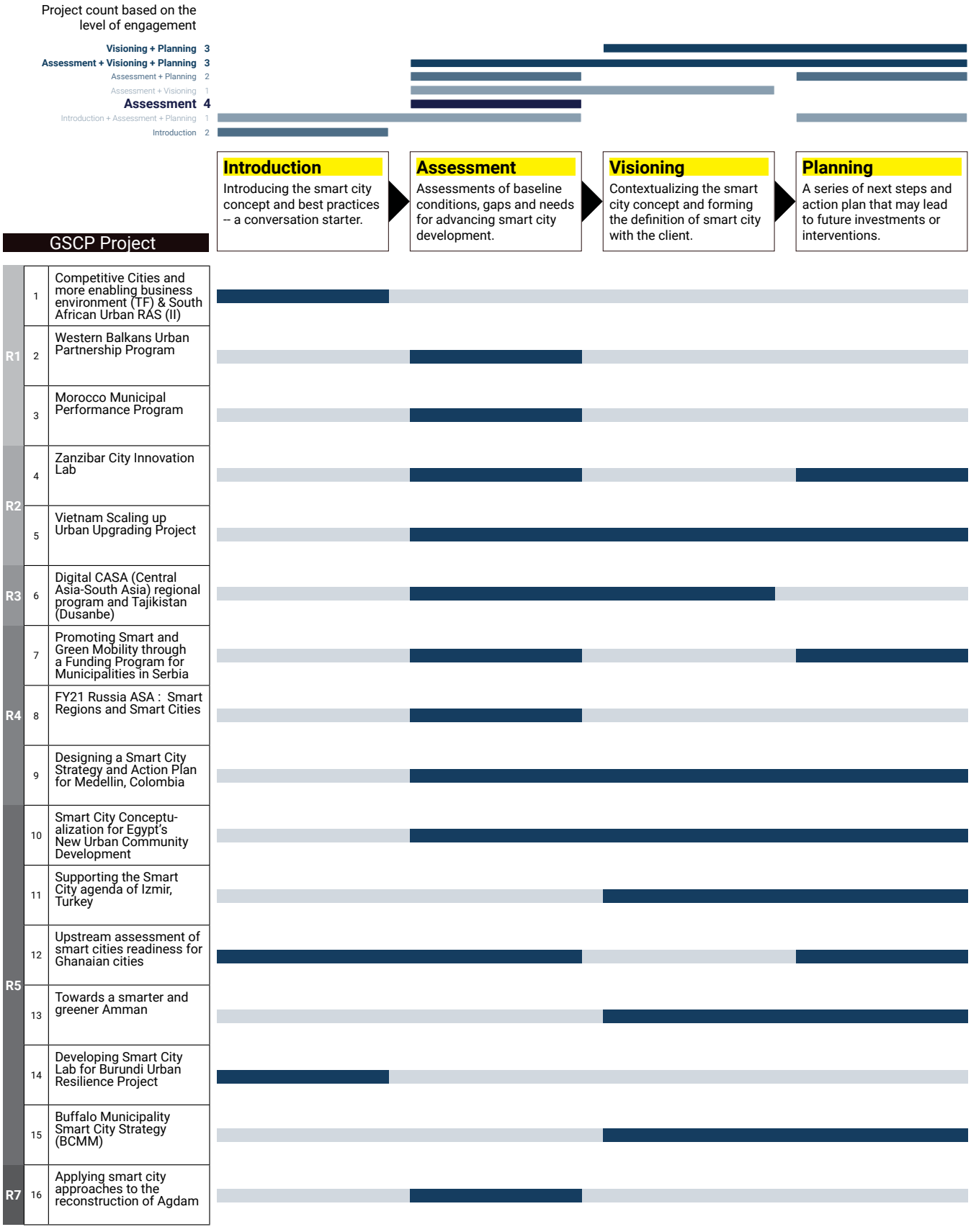
- Understand what smart cities mean to key stakeholders and generate a common vision.
- Find ways to break silos strategically, institutionally and in project design or implementation between urban and digital developments and across sectors.
- Plan for an integrated, multisectoral, or area-based intervention.

Key activities

- Understand what the city aspires to be through a desk review of the existing city strategic plans, and whether and how it relates to the national strategic plans—digital, urban, smart city, and others. Benchmarking is a useful way to inspire key stakeholders.
- Know where the city is through a baseline assessment across smart city building blocks and an inventorying of smart city related projects or initiatives.
- Define where the city wishes to go by formulating a smart city vision and prepare a strategy or roadmap to get there in the short and long term.
    - Understand and address institutional bottlenecks and human capacity challenges
    - Operationalize priority actions in the short-term to prepare project development
    - Build in a process for monitoring and evaluation of the progress and impact, lesson learning and course correction.

In the entire GSCP portfolio, 16 of 50 projects in total engaged with smart city strategic planning at varying depth and coverage. Figure 3.1 maps GSCP strategic planning engagements according to the type of activities conducted under each project. The figure depicts key activities of strategic planning—introduction, assessment, visioning and planning—in an ideal order but they can take place in different order and coverage.

Figure 3.1. Range of engagement in GSCP strategic planning projects.



Source: Authors' own creation (2023).

An engagement in South Africa concluded at an early stage of introducing the smart city concept to several municipalities. Similarly in Burundi, the team has explored the possibility of developing a smart city lab, by benchmarking other city examples and through a stakeholder workshop. In most projects, GSCP supported smart city assessments of varying kinds, some of which led to subsequent activities and produced concrete planning products such as new institutional arrangements, implementation roadmap, and list of potential interventions or investments.

Smart city strategic planning can occur at the national or city level, depending on the initiator of the agenda and governance arrangement—centralized or decentralized. Examples of strategic planning initiatives at the national and city level follow.

National government-led initiatives

- *Developing smart new towns*: In Egypt, the national government through the New Urban Communities Authority (NUCA) is leading the process of designing new urban communities as smart cities. It includes the new administrative capital, and gradually applying the concept to existing cities. NUCA started by contextualizing the smart city concept and preparing a roadmap for developing a national smart city strategy. The roadmap entails four phases, which represent the common steps for upstream smart city development, namely: (i) strategy preparation, (ii) assessment, (iii) strategy development, and (iv) implementation.
- *Reconstructing postconflict or disaster areas as smart cities or villages:* The Government of Azerbaijan seeks to apply the smart city approach to reconstructing towns and villages in its liberated areas. In particular, the GSCP is supporting a reconstruction project in Agdam. The project developed a master plan, which provides an opportunity to integrate smart city approaches and solutions from the outset.
- *Incentivizing and supporting local governments' smart city proposals.* GSCP supported the design of the Serbia Local Infrastructure and Institutional Development Project, which aims to improve the capacity of local self governments (LSGs) to manage sustainable infrastructure. Smart mobility, which encourages citizens to use modes of transport other than gas-powered vehicles, is one of the key components. Based on the assessment of the mobility situation in 145 LSGs and benchmarking of smart mobility projects in other countries, the GSCP expert helped the national government design a competitive funding program that LSGs can apply for smart mobility initiatives.

City government-led initiatives

Local governments can also initiate and drive smart city strategic planning. For instance, Izmir Municipality developed a strong interest in smart city development after the mayor and his delegates participated in the 2019 Smart City World Expo World Congress in Barcelona. GSCP, in collaboration with the IFC team, supported the municipality and key stakeholders by conducting a baseline assessment and developing a comprehensive strategic framework for smart city development. It includes the vision, roadmap, governance, and concrete next steps. Figure 3.2 describes the process and major outputs that come out of the strategic planning process.

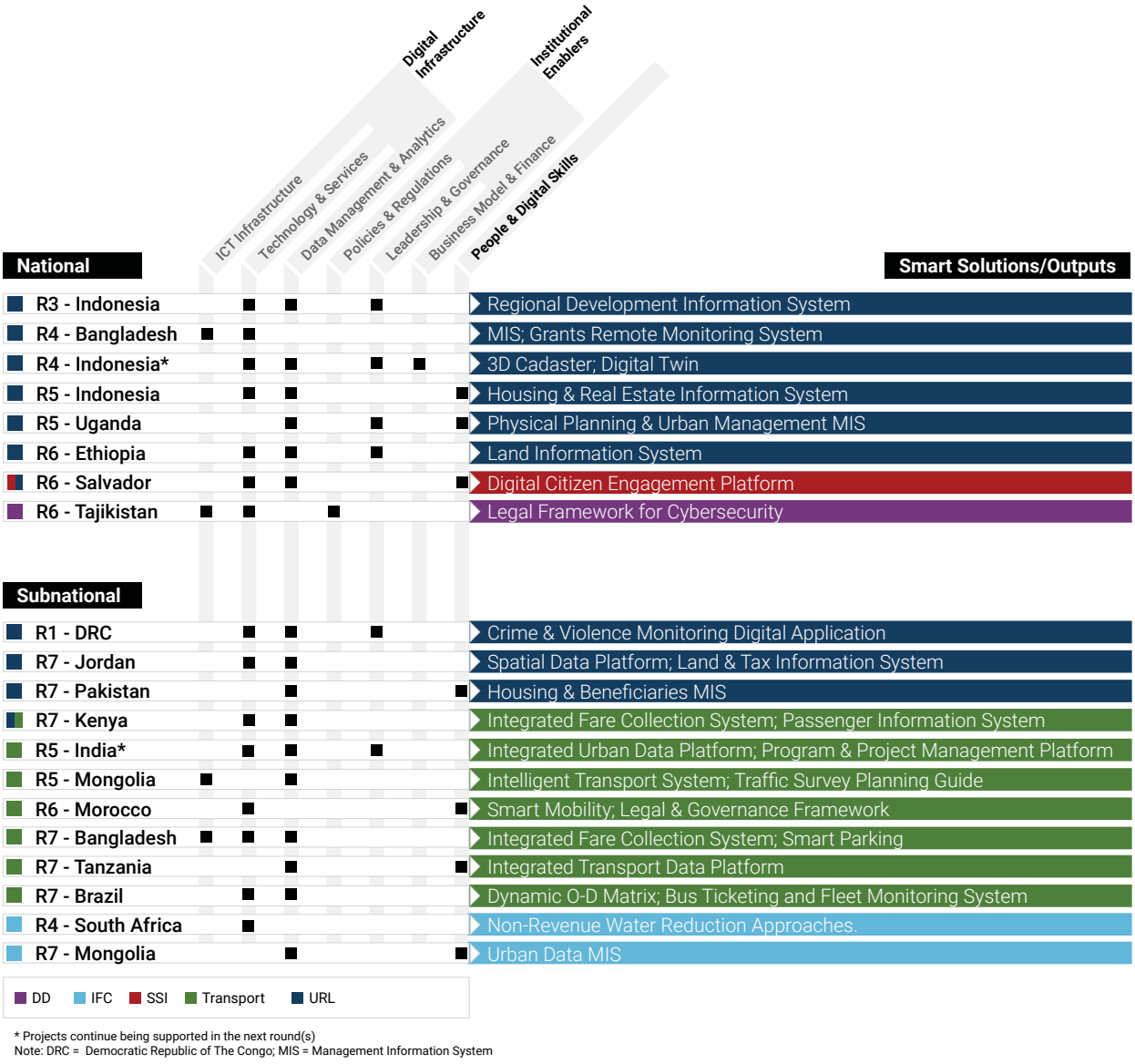
Figure 3.2. Strategic planning process in Izmir.

Source: GSCP deliverables (2023).

3.2 Smart solution development

Smart city initiatives in practice often mean problem or sector specific solutions. GSCP has supported a range of sectoral initiatives at various stages of digitization and digitalization, which are mapped across the key building blocks to demonstrate where the demands for concrete smart city investments were concentrated (figure 3.3). GSCP experts met these demands by assessing the digital, sectoral, and institutional environment for data management and system development and providing technical input to design specific solutions.[1] As will be discussed, most smart solutions supported by GSCP are geared toward advancing digitization and digitalization in a sector, with a few presenting a potential contribution to digital transformation.

Figure 3.3. Overview of GSCP engagements.



* Projects continue being supported in the next round(s)
Note: DRC = Democratic Republic of The Congo; MIS = Management Information System

Source: Authors' own creation (2023).

Nineteen of the twenty-one URL and Transport projects dominate GSCP's portfolio in supporting sectoral smart solutions: 10 URL, seven Transport, one URL and Transport, and one URL and SSI. This is not surprising considering that the program is hosted under GPURL, and that transport is the leading sector for smart city development. Interestingly, most URL projects were initiated by the national government and related to developing information systems. In many contexts, the national governments host and manage data related to urban assets such as land and properties and are interested in overseeing cities' operations and performances efficiently and effectively by deploying a nationally developed ICT system.

For the type of smart investments, the mapping indicates that many WBG clients are interested in developing an information system that would help improve data driven urban management and sectoral operations. It requires designing a series of components and procedures to identify, collect, process, and store data and subsequently analyze them to produce insightful information and facilitate decision-making processes. It is also necessary to understand, reflect on, and improve the existing operational procedure, which in turn requires institutional capacity building or adjustments to the new way of working facilitated by the information system. For example, a housing information system development should consider who has the authority to manage the system and how the information feeds into the existing housing policy making.

Clients are at different stages of digitization and digitalization in developing information systems. Many often face basic challenges to identify and organize necessary data and are at the digitization phase, transitioning from analogue to digital data management and analytics. For the Dodoma Urban Transport and Decongestion Program, the client requested for technical guidance to consolidate existing transport data and develop new data collection measures to create an integrated transport database to inform transport planning. The assignment began with data mapping and surveys with relevant stakeholders before developing a database and other technical solutions because gathering various transport data requires coordination among different agencies.

GSCP has supported the development of several information systems, notably, Ethiopia's Land Information System, Indonesia's Housing and Real Estate Information System, and Uganda's Physical Planning and Urban Management Information Systems, and other similar information systems. The technical depth of support varies depending on the entry points—pre- or post-system development. When systems are already developed, to maintain and update them becomes a critical task that requires both technical and human capacity development.

Equipped with a robust information system, the more advanced clients are already considering to leverage smart solutions for real time monitoring and operations or sophisticated modeling of the complex reality. In Indonesia, the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency explored the potential of 3D cadaster and digital twin, which is only possible on modernizing its land information system (box 3.2).

At the city level, many transport projects seek to develop an integrated system or data platform to manage traffic and operate transit—such as transit payment system, ticketing system, and passenger information system. Accordingly, GSCP has supported the architecture design and institutional arrangement, particularly through conducting technical assessments, providing best practices, and offering operational recommendations. In Mongolia, GSCP reviewed the hardware—traffic signals, cameras, fiber optic network—and software—such as area traffic control system and transit apps—components of Ulaanbaatar's intelligent transport systems (ITS), conducted the needs assessment, and proposed a roadmap to upgrade the ITS.

Notes

1. Not all GSCP support led to smart solution development as some engagements concluded at an early assessment stage. In Ekurhuleni, South Africa, the IFC team explored the possibility of applying smart technologies to addressing non-revenue water (NRW) but did not proceed to investment design as conventional methods were deemed more effective for the client's needs and capacity.

4 Smart City Development Challenges and Opportunities

Despite the potential to leverage data and digital technology to achieve urban aspirations, smart city development has encountered various challenges in practice. This section first summarizes key findings from GSCP engagements (table 4.1) and discusses some of the main challenges as observed and experienced by GSCP in its engagements with developing countries.

4.1 Key findings

- Cities have high ambitions for applying new, disruptive digital technologies to city planning and management, but their operational reality is at various points of the digitalization pathway, often challenged with the adoption and mainstreaming of basic digital technologies.
- Sectoral investments in digitalization are neither well connected to each other nor necessarily sustained over time on their own. This can be partially addressed through effective strategic planning and institutional coordination upstream. Better designed and interconnected investments at the sectoral project level can also increase the possibility of creating more consolidated impacts.
- Institutional enablers and human capacities are critical part of smart city development. Addressing knowledge, skills, and behavioral gaps in municipal organizations, industries, and other partners has been an important part of the GSCP engagement. Yet, more attention is required to provide a systematic support to building digital, institutional, and human capacities rather than one-off training or generic study tours.
- Of the key building blocks, digital infrastructure is a critical factor determining adequate technologies for designing smart solutions. Although GSCP engagement has not covered digital infrastructure directly, as it usually requires national investments and has been the core business of the World Bank's Digital Development unit, it needs to be an essential part of the smart city readiness and other technical assessments.

Table 4.1. Key takeaways from GSCP engagements on smart city building blocks.

BUILDING BLOCK	KEY FINDINGS
Data	• Developing a data ecosystem at the city level is an emerging area that requires more attention. It involves data collection, analytics and visualization, data governance and management, data sharing protocols, interoperability, data privacy and cybersecurity, among other things. • Human capacity for data analytics, which is more about analytical skills than digital skills, is critical but often lacking.
Digital infrastructure	• The state of digital infrastructure including the availability and stability of electricity and ICT connectivity determines the adequate type and level of applicable digital technologies. • Smart city assessments should cover the national or citywide investments, planned or ongoing, in digital infrastructure and adequacy of institutional and human capacity to manage and update digital infrastructure.

Digital technology	• Most investments still focus on sectoral information systems—such as land, housing, transport—or project management information systems. Critical questions remain with regards to:
	  • How to sustain an information management system in a sector and improve its interoperability with other systems
	  • How to integrate various information systems to create a citywide data platform.

Institutional enablers	• Smart city strategy and roadmap development requires sufficient engagement time and can be process intensive. • They need to focus more on a "how to implement" guide for priority setting, financial mobilization, and investment phasing, without which implementation of strategies becomes difficult. • Strong leadership enabled multisectoral, citywide strategic planning through extensive stakeholder engagement, especially with the private sector. • A dedicated institution such as a smart city lab and smart city unit can help steer the process over time, if given clear roles and responsibilities, mandates, incentives of smart city development.
People and digital skills	• Many cities are in need of building both digital and strategic capacity or know-how to plan, manage, procure, or sustainably operate smart solutions that are novel and technically complicated.

4.2 Challenges

GSCP engagements shed light on weak or missing links in the smart city model, notably between strategic planning and investment design, across sectors where investments in digitalization are made in silos but neither well performing nor sustained over time, and between digital and sectoral expertise.

Challenge 1. Connecting strategic planning with investments

Many cities encounter challenges in translating smart city ambitions into implementation as smart city strategic planning does not always lead to concrete investments. GSCP has supported both upstream smart city strategic planning and downstream design and implementation of pipeline and ongoing operations. Ideally, the former would lead to the latter as national or city governments would implement strategic plans through investments, publicly funded or privately financed. However, GSCP has observed a missing link between the two in its portfolio, with most cases belonging to only one of the two streams. This is largely because decision making on WBG lending or investment is affected by multiple factors, such as countries' readiness, development priorities, and overall investment capability. In addition, it is difficult for a support program like GSCP to track the whole development trajectory, which can go on for many years, as the program comes at a particular point of the process and usually covers a defined period only.

Challenge 2. Integrating silo smart solutions for citywide impacts

Various smart city initiatives are often not well connected to each other. Without integrated planning and management, they are usually implemented in silos and do not add up to make cities smarter and more efficient. Two-thirds of GSCP engagements are related to developing or improving sector specific information systems that can improve government functions like project management systems or public service delivery to citizens and businesses. The scope of work does not go beyond individual information systems and they run the risk of being designed without interlinks to other systems and initiatives within a city. Although effective cross-sectoral coordination is a broader challenge at stake, disjointed investments challenges the inherently integrated nature of smart city development. Building a system of systems which is foundational for smart cities requires a citywide planning and portfolio approach that can guide and connect different sectoral investments. On the other hand, the lack of systemic thinking can undermine the sustainability of investments in individual systems.

Challenge 3. Sustaining the impact of smart or digital investments over time

Digitalization often happens separately in sectors without or even despite a national or city level strategy. Moreover, such sectoral investments in digitalization are not always successful or well sustained, which undermines the possibility of being connected to other sectoral efforts and creating synergies at scale. Rather, a form of digitalization trap seems to exist whereby countries struggle to move beyond a certain level of digitalization.

GSCP has observed that various information systems and digital services in many cities have been quickly outdated and underutilized. Therefore, they require reassessment and often fresh investment for major updating or even new development of such systems. This is usually because of the disconnect between sectoral and digital expertise, whereby digital systems are developed without sufficient knowledge of a sector, business flows, institutional arrangements, and user needs and capacities. Basic knowledge of data and digital technologies among WBG teams and clients is also often limited.

Challenge 4. Enhancing institutional and human capacity

Bridging this gap requires unique expertise to understand and address both digital and sectoral needs, which GSCP has facilitated by matching WBG teams with seasoned experts. Yet, without building an institutional environment and adequate human capacity to understand, utilize, maintain, and upgrade such systems sustainably, many investments in system development and improvement run the risk of becoming wasteful over time. This calls for a more systemic, longer term attention to the institutional and human aspects of smart city development.

Challenge 5. Promoting digital safeguards and inclusion in smart cities

As cities become smarter and digital solutions pervade every part of urban development, issues such as cybersecurity, data privacy, and digital inclusion grow prominent. Project evaluations should address not only how smart solutions may facilitate improvements, but also how they may come with risks of data leakage, potential misuse, system malfunctions, access inequity, and other issues. As a program that promotes smart city development in World Bank projects, GSCP will bring these topics into the center of smart city future engagements and collaborate with other global practices (GPs) that focus on these issues, such as the Digital Development GP and Social Sustainability and Inclusion GP.

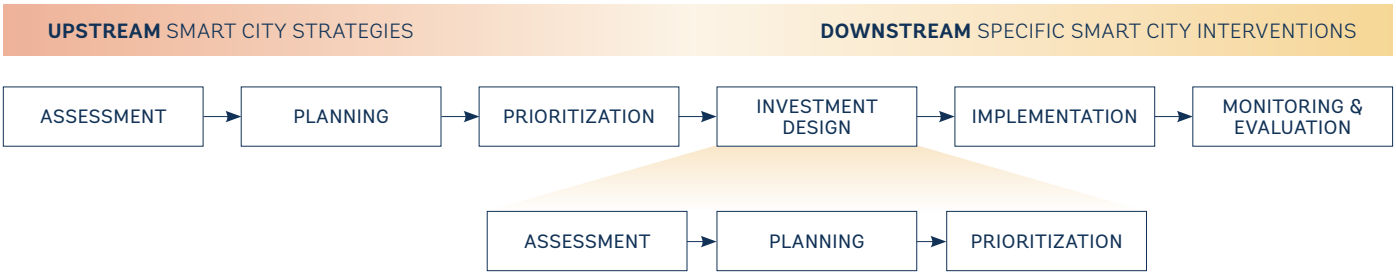
4.3 Opportunities

In addition to challenges, GSCP engagements shed light on the factors that can contribute to connect upstream and downstream initiatives better and to integrate sectoral investments to yield scale, citywide impacts. Some of the assumptions that WBG can work with to increase the probability of success are:

- Going upstream to downstream is more feasible for WBG to support when:
    - Smart cities are the national development agenda, backed by the national program and funding as in India and South Africa.
    - Digitalization is a crosscutting agenda of the city development backed by strong city leadership as with Izmir and Amman, Jordan.
    - Cities manage sectoral investments in digitalization as a portfolio and develop an integrated or interlinked package of investments to mobilize public funding or attract private financing.
- Linking sectoral, downstream investments to upstream smart city development is possible when:
    - The existing national or city program opens an opportunity to introduce and scale up the smart city agenda, notably through a series of operations as with Indonesia One Map, Amman BRT, and Lima smart mobility.
    - Sectoral information and operational systems can be a steppingstone for citywide digitalization through robust assessment of the digital, institutional, sectoral environments, and human capacities.
    - Such systems are continuously maintained, utilized, and upgraded over time for sustainability; and interconnected with other systems within a city for interoperability.

WBG teams may follow the guiding questions to define engagement level and scope and identify entry points and concrete activities across the smart city development process (figure 4.1).

Figure 4.1. Smart city development process.



Source: Authors' own creation (2023).

Upstream engagement – Strategic planning

- Are you engaging a national government or city government? If both, who leads the agenda?
- National government – Is there a national smart city or digital strategy?
    - If yes, is it feasible to identify a pilot city or design a national program supporting city level implementation? Can it be considered for WBG investment down the line?
    - If not, is strategic planning of any interest? What sectors can drive the smart city agenda? How can the strategy build on the existing national initiatives?
- City government
    - Assessment: What is the core problem statement? How does it benefit from an integrated approach? What role does digitalization play in addressing the problem and facilitating and integrated planning and management?
    - Planning: What are strategic city documents that the smart city agenda can build on? Is there a high-level commitment or mechanism to facilitate cross-sectoral coordination? Can it be a strong vehicle for strategic planning?
    - Prioritization: What will enable a city to develop an integrated package of investments? Where does collaboration naturally take place? Can low hanging fruit be considered for WBG investment down the line?

Linking upstream and downstream engagements – Portfolio approach

- Where in the country partnership framework (CPF) can the client's interest in smart cities fit?
- What does WBG support in a country through advisory services and analytics (ASA) and lending?
- What do other sectors engage in smart city relevant initiatives?

Downstream engagement – Investment design and implementation

- Within a city, are you engaging with one sector or multiple sectors?
    - One sector: Is there room to conduct a sector wide digital assessment? Can it be extended to other sector's digital initiatives?
    - Multisector: Can the whole of the government digital assessment be conducted? What will be the most crosscutting digital investment?
- For a specific ICT system development:
    - Who is best positioned to develop, maintain, and update the system—national versus the city government and among city departments?
    - How can it be designed to best serve the prevailing operational needs with a view to upgrade and expansion in the future?
    - How is it connected to other systems at the national or city level? What are the weaknesses in interoperability and suggestions for addressing them?

The next section introduces a wider set of resources offered by different parts of WBG that can offer insights into some of these questions on smart city engagement and enrich the menu of proposed actions. The last section will present how WBG can support smart city development processes and how GSCP can add value through technical advisory services and knowledge production.

Notes

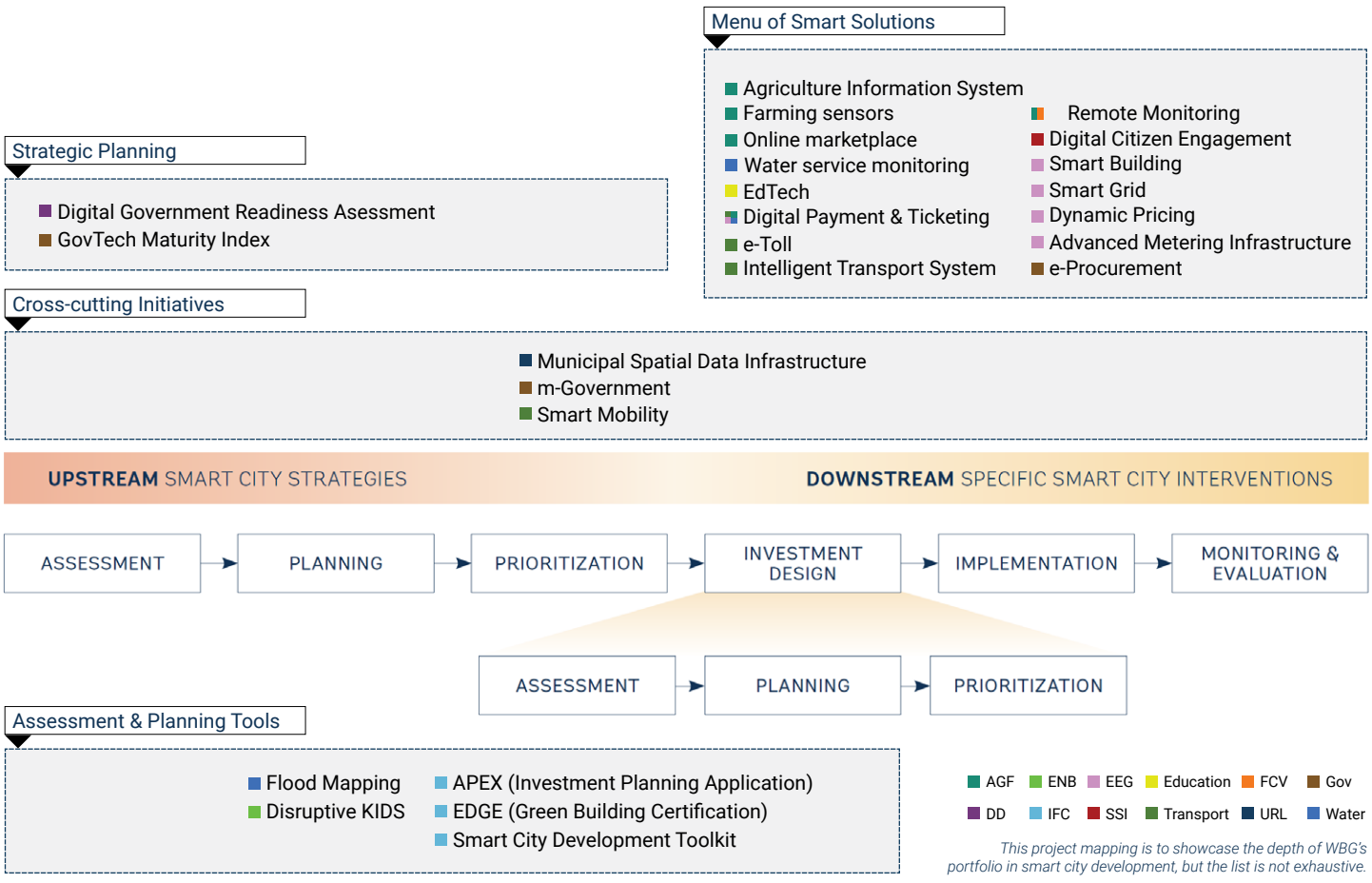
1. Hanna, N. K. 2018. Smart Cities: How Can the World Bank Help Cities Become Smarter? Pages 15 and 16. (unpublished)

5 WBG Smart City Initiatives and Resources

The World Bank Global Practices (GPs) and IFC provide a wide range of opportunities to promote smart cities from a sectoral perspective, as they explore application of smart solutions to different city functions. This section presents an overview of key initiatives and useful resources in selected WBG sectors that are relevant for smart city development. The mapping of smart city's sectoral or thematic initiatives at WBG aims to enhance awareness of what others are doing and contribute to facilitating cross-sectoral fertilization and collaboration.

This curation is based on a desk review of key resources offered on the websites, internal and external, of GPs and crosscutting themes at the World Bank and the IFC. The review searched for analytical and advisory services (ASA) from 2015 to 2022, that have harnessed data, digital technologies, and innovative solutions in urban areas, using key words such as smart, digital technology, digital economy, data, ICT, and innovation. Key words such as local government and municipality were used to narrow down to the initiatives with a city focus. Geographically, the review also included regional or territorial development initiatives that cover both rural and urban areas or aim to strengthen urban–rural connections. The review is complemented by further search in the World Bank's Open Knowledge Repository, Open Learning Campus, and Operations Portal.

Figure 5.1. Mapping of WBG smart city initiatives and resources.



Source: Authors' own creation (2023).

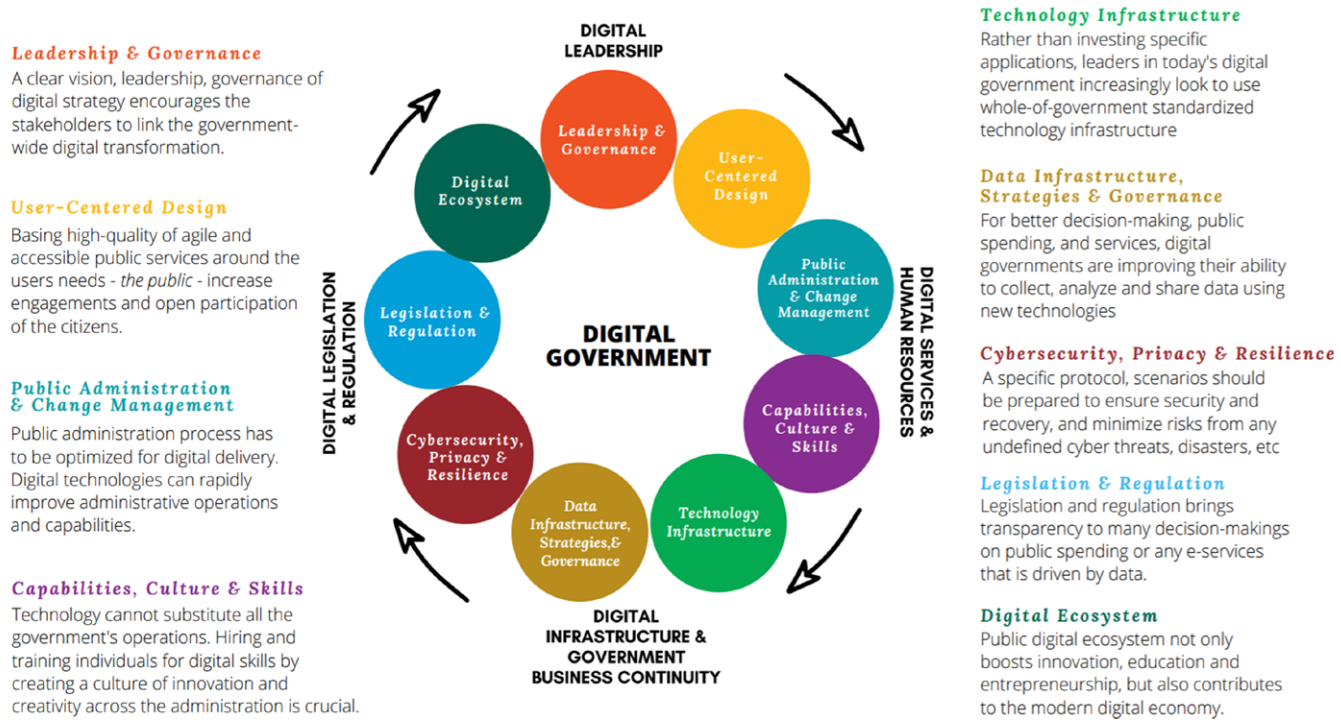
Figure 5.1 maps these initiatives on the smart city development process proposed in Section 4.3 to demonstrate where these resources can be most useful. Some initiatives are more comprehensive and cover the entire upstream-downstream engagement, such as CPLs for establishing municipal spatial data infrastructure (MSDI), GovTech's m-government, or smart mobility by the Transport GP. These initiatives focus on the foundations of urban planning and governance. Other initiatives propose specific smart solutions to address sectoral issues or improve service deliveries that are relevant for cities. For instance, food and agriculture initiatives typically operate outside cities, but solutions like digital marketplace can directly benefit the urban population by providing easier access to fresh produce. Another similar example is the Energy and Extractive GP which operates mainly at the national level but develops smart solutions such as advanced metering infrastructure or mini grid that can help manage energy consumption and even enable production in cities.

The summary that follows is by no means comprehensive—since the review focused on the website of each GP and IFC—and the result is heavily focused on the analytical and advisory work, notably toolkits, frameworks, guidance notes, handbooks, case studies, webinars, and e-learning courses. These initiatives are highlighted because they cover or relate to the urban context and are thus relevant for smart cities. Despite their relevance, many initiatives have not yet been tailored for urban-scale application, which is an opportunity to explore further. For instance, the Digital Government Readiness Assessment is for national governments and can be modified for application to municipalities.

5.1 Digital development: Digital government

Digital Development (DD) GP spearheads digital inclusion and transformation initiatives at the World Bank, where more than 74 percent of the projects have ICT components. The GP primarily supports demands for digital applications, skills, and platforms to stimulate the digital economy. One of its flagship products is the Digital Government Readiness Assessment (DGRA),[1] which helps governments in developing countries assess their readiness toward digital transformation. It elaborates on nine core foundations to build open and agile digital government infrastructure and operations (figure 5.2). The GP has also produced several country diagnostics that provide a snapshot of the state of the digital economy[2,3] in various World Bank client countries for each of the pillars of the digital economy: digital infrastructure, digital public platforms, digital financial services, digital businesses, and digital skills. The GP has also produced specific analytics and guides related to data operation, capacity building, cybersecurity, and disruptive technology. Cybersecurity and data protection recently emerged as the major concern amid the increased use of digital technology. Despite working mostly with national governments, many of DD's frameworks, guidelines, and analytics are applicable to urban contexts, which offer strong opportunities to collaborate on smart cities.

Figure 5.2. Digital Government Readiness Assessment (DGRA) framework.



Source: World Bank DGRA team, 2020

5.2 Governance: GovTech

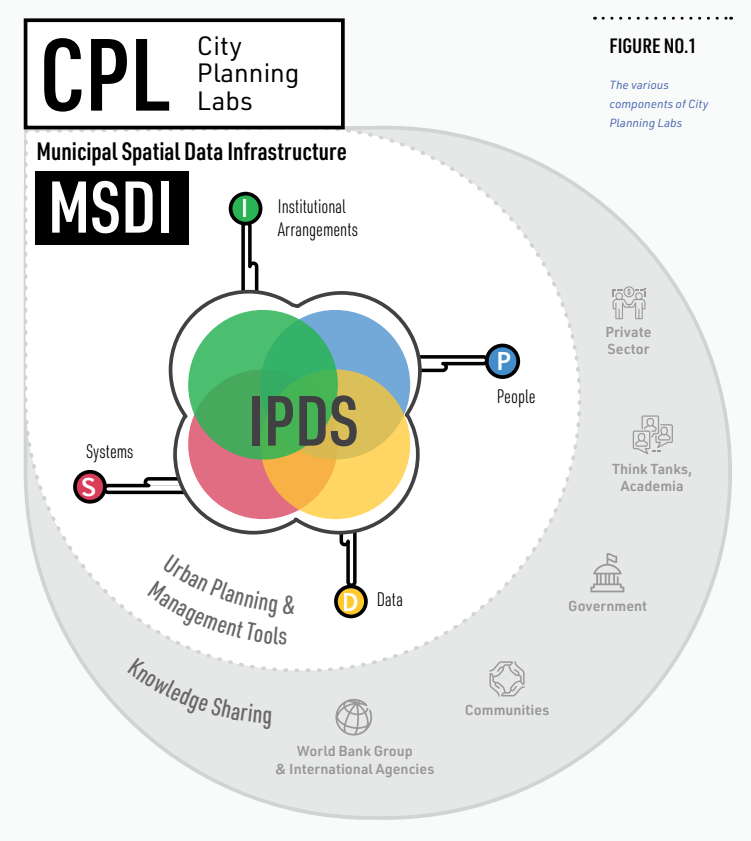
Governance GP supports client countries to leverage ICT and digital technologies to enhance government operations and public service deliveries through four GovTech focus areas: supporting core government systems; enhancing service delivery; mainstreaming citizen engagement; and fostering GovTech enablers. Global Practice introduced the GovTech maturity index (GTMI)[4] in 2020 to provide a baseline and a benchmark for GovTech maturity and identify improvement opportunities and potential digital transformation projects. The index comprises 48 readiness indicators and measures data from 198 countries. Despite being mainly used at the national level, the GTMI is also adaptable for assessing subnational governments' readiness.

Additionally, the Governance GP invests in smart solutions for public procurement and administration and government management information systems. For example, e-procurement is a prevalent solution within the GP, whereby digital solutions are applied to improve procurement services and procurement data analytics and prevent fraud. The GP also elevated the concept of mobile government, m-government, as the next generation of e-government. This concept recognizes the wide use of mobile phones and thus leverages mobile based access to government services, instead of relying on access to the internet via laptop or personal computer.

5.3 Urban, resilience and land: Smart cities

URL GP has explored various advanced methods for geospatial data collection, mapping, and analytics, primarily using unmanned aerial vehicles (UAV) and satellite imagery. URL teams use rich spatial data that enable them to map key urban assets—land parcels, buildings, public infrastructure, and facilities—assess vulnerability, and facilitate property valuation and taxation (figure 5.3). The application of smart solutions is also prominent in URL projects, particularly to develop sectoral information and management systems, although they are not always linked to citywide, strategic, or systemic thinking.

Figure 5.3. IPDS framework for municipal spatial data infrastructure by the city planning labs.



City Planning Labs (CPL)[5] are one of the most comprehensive smart city-related initiatives that aims to strengthen the foundation of smart cities and promote evidence driven planning for sustainable and resilient cities. The program helps municipal governments to establish municipal spatial data infrastructure (MSDI)[6] to improve the urban planning process.

> "MSDI functions as the platform by which geospatial information can be organized, shared, and leveraged to tackle the many challenges of sustainable urban development."
> MSDI Manual

Source: World Bank. Municipal Spatial Data Infrastructure. 2021

CPL offers a suite of toolkits to assess and operationalize municipal data ecosystems, around four pillars, namely: institutional arrangements, people, data, and systems developed as an IPDS framework. MSDI is a fundamental element for smart city development because the standardization and consolidation of geographic information contributes to the city data ecosystems and allows the municipalities to share and use spatial data with other types of data for urban planning and management.

5.4 Transport: Smart mobility

Transport GP explores technological and digital innovation to improve safety and efficiency of transport operations and promote their decarbonization. Global Practice supports multiple countries and cities in implementing smart solutions, including the implementation of e-tolling systems, digital ticketing, real time transit and vehicle information, road data platform, and smart traffic light systems, among many others. Notably, the smart mobility concept comprehends the GP's extensive portfolio to harness technological solutions to move users and goods more efficiently, safely, and sustainably. Similar to smart cities, smart mobility needs to cover both technical and institutional aspects of mobility in utilizing data and technologies. Considering its complexities, one of the GP's ASA projects, P170753, is preparing a smart mobility implementation toolkit for the World Bank client countries and cities.

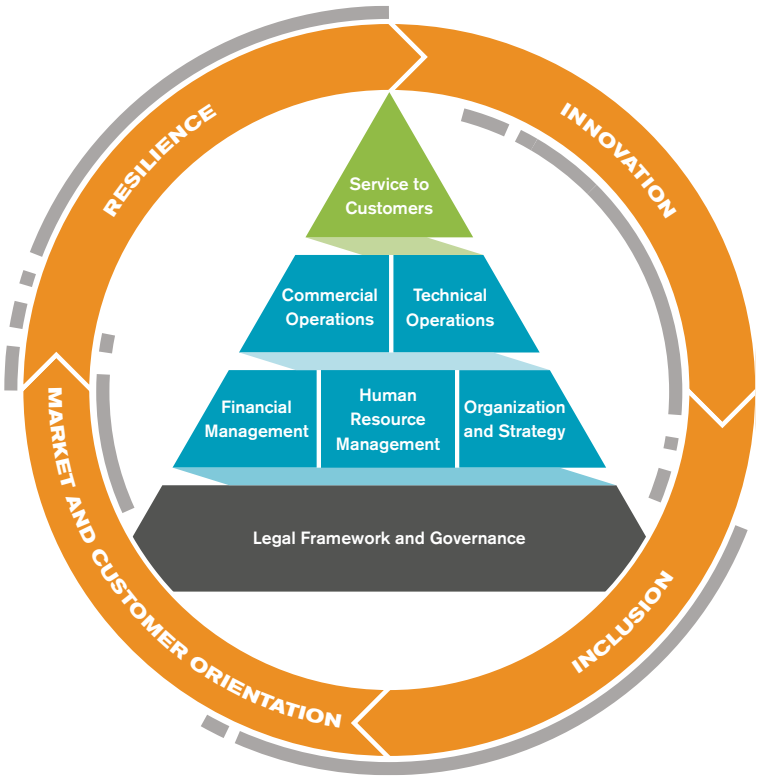
5.5 Energy and Extractive: Smart grid

Energy and Extractive GP has embraced ICT and digital transformation particularly to promote energy efficiency. As cities consume most of the global energy, smart city development needs to pay more attention to energy efficiency by contributing to its production and managing consumption. Although most initiatives address issues beyond city boundaries—national grid mapping, assessment of a country's potential for renewable energy, and energy data analytics—several projects are directly relevant to cities, such as smart grids, electrification—of vehicles and households—smart buildings, and renewable energy. One of the GP's most recent ASA, "Utility of the Future"(Project code: P176000), highlights five megatrends in the energy sector— decarbonization, decentralization, demand disruption, digitalization, and disintermediation. Technology applications at the utility levels include using augmented reality and drones to support asset management, advanced metering infrastructure (AMI), mobile money for electricity payments, and mini grids. Smart technologies also enable innovative regulatory interventions such as smart/dynamic tariffs and consumer-focused key performance indicators (KPIs).

5.6 Water: Smart water service

Water GP focuses on leveraging digital solutions to improve water and sanitation service delivery—a critical agenda for many cities, particularly in the context of informal settlement upgrading. The Water and Sanitation Program (WSP) conducted a study[7] on the potential of ICT in improving water and sanitation services globally, focusing on African countries. One example is the "mWater" platform developed by the Senegalese mobile solutions company, Manobi, through a public–private partnership co-funded by the WSP. It is a service-oriented platform for a mobile-to-web monitoring system. Additionally, The Global Water Security and Sanitation Partnership[8] —a multidonor trust fund managed by the GP—is advancing a new paradigm to provide water supply and sanitation services called the "Utility of the Future" program (UoF). The UoF[9] includes innovation as one of its main traits and promotes novel methods using digital technologies (figure 5.4) – which can be relevant for cities.

Figure 5.4. Utility of the Future success pyramid.



Source: Adapted from Heymans et al. (2016) as cited in Lombana Cordoba, Camilo, Gustavo Saltiel, and Federico Perez Penalosa. 2022. "Utility of the Future, Taking Water and Sanitation Utilities Beyond the Next Level. A Methodology to Ignite Transformation in Water and Sanitation Utilities." World Bank, Washington, DC.

5.7 Social sustainability and inclusion: Digital citizen engagement

The SSI Global Practice uses technologies to enhance two-way interactions between citizens and governments, encompassing innovative uses of the internet and social media, mobile networks, digital radio, blockchain systems, IoT, cloud computing, and digital platforms. One of the highlights is a Digital Citizen Engagement (CE) platform[10] a set of modular and reusable tools, components, and other technical assets covering common mechanisms such as grievance redress mechanisms (GRM), community score cards (CSC), and participatory budgeting. A "Lego Approach" is adopted, whereby the software components are created in a modular fashion so that individual components, groups of components, or entire applications can be repurposed for different projects (figure 5.5). For instance, a project can start with a set of Lego choices and phase into the development of other features. Citizen engagement and participatory approaches are crosscutting and highlight relevant for urban development.

Figure 5.5. Starting a digital citizen engagement platform with a set of Lego choices.

GRM	Citizen Report Card	Participatory M&E
Participatory Social Assessment	Community Score Card	Participatory Budgeting
Community Sub-Project Cycle Management	Input Tracking	**Community Procurement**

Source: World Bank. Amplifying People's Voices: Opportunities for Mainstreaming Citizen Engagement Through Digital Technologies. 2022.

5.8 Environment and biodiversity (ENB): Green and blue tech

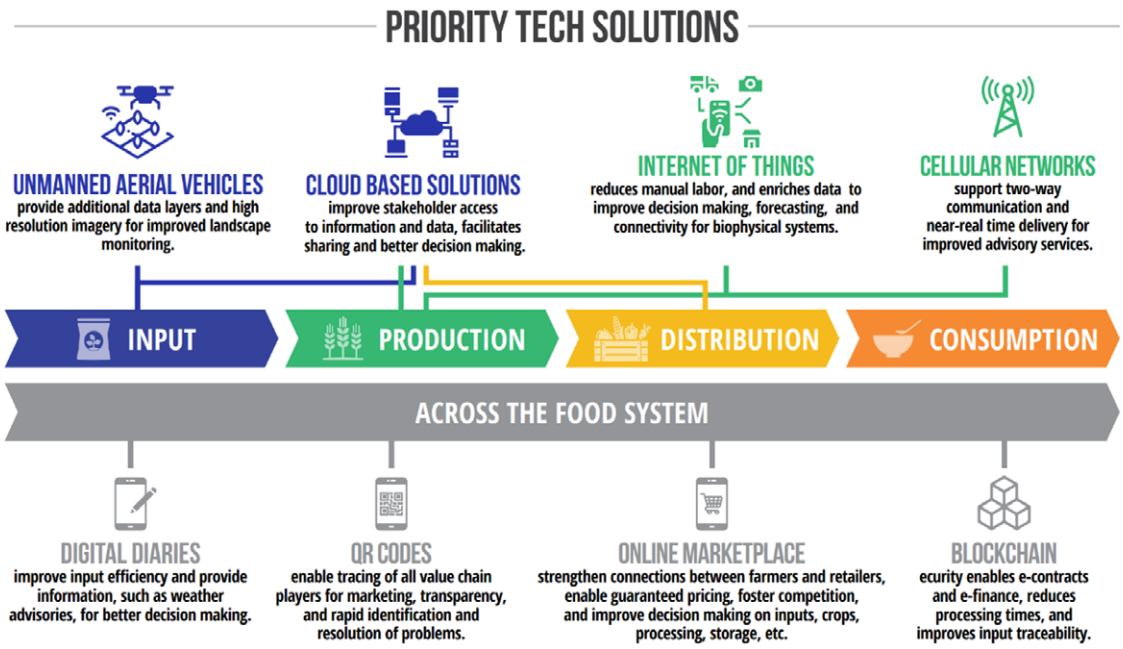
Similar to other GPs, the ENB GP leverages technological tools to support decision making and improve environmental and natural resources management. Its signature program is the Disruptive KIDS — Knowledge, Information and Data Services.[11] Disruptive KIDS brings together a vast range of useful resources ad products in one place: data portal, eBook, story maps, illustrative visualization, and external links. The KIDS Helpdesk functions as a one-stop shop to help operational teams to use various technologies better and operate World Bank wide.

5.9 Agriculture: Digital Agriculture

Agriculture Global Practice adopts digital solutions to improve efficiency across its value chain. Smart interventions in the agriculture sector generally aim to improve production quality and efficiency and facilitate access to markets and finances. The latter is more relevant to smart cities, with smart solutions enhancing urban–rural connections within the food supply chain. For instance, a digital marketplace enables the urban population to access fresh products directly from the producers. Advanced urban agriculture technologies can also support urban farming and improve sustainability and resilience.

The GP published "What's Cooking: Digital Transformation on the Agrifood System"[12] in 2021, which investigates how digital technologies can accelerate the transformation of the overall agrifood system. One of the digital agriculture profiles that the GP also produced for Vietnam evaluates the prevailing landscape of digital agriculture and potential entry points for adopting innovative technologies (figure 5.6). It includes technical solutions for distribution and consumption that are relevant for urban residents.

Figure 5.6. Priority tech solutions for Vietnam digital agriculture development.



Source: World Bank. Digital Agriculture Profile. 2021.

5.10 FCV: Remote engagement

Smart solutions in the fragility, conflict, and violence (FCV) context revolve around supporting remote operations, including data collection and project supervision, monitoring and coordination. The FCV group has promoted the use of satellite imagery and geospatial data to produce analytics and digital applications—GEMS, KoBoToolbox, and other mobile-based apps—to reach areas or sites with limited field access. Supported by the Korea Trust Fund for Economic and Peacebuilding Transitions (KTF), the World Bank has developed and used the Geo-Enabling Initiative for Monitoring and Supervision (GEMS) to enhance monitoring and evaluation and remote supervision systematically of the World Bank projects in FCV settings.

5.11 IFC: Smart city development toolkit

IFC has supported a wide range of investments in sectoral smart solutions as well as strategic smart city development, including several engagements that were supported by GSCP. A notable engagement is the World Bank and IFC support for Amman's smart and green city strategy. Sectoral smart city investments proposed through this strategic engagement include digitalization of bus operations, healthcare services, smart street lighting, and air quality monitoring among others. IFC has also supported cities to develop smart city strategies and change of management capacity. Building on its engagement experiences, IFC developed a smart city development toolkit, which provides IFC teams a practical guidance for upstream smart city engagement in six key focus areas: mobility and planning; environment and climate; urban management; government and public sector;

security and safety; and livability and vibrancy. The toolkit helps identify investment opportunities and implementation challenges, prioritize investments, and develop a roadmap. Additionally, the IFC has developed other innovative tools such as EDGE[13] to design and certify resource efficient and zero carbon buildings and APEX,[14] an investment planning app for cities.

5.12 Education: EdTech

Education technology or EdTech supports and enriches teaching and learning experiences and improves educational management and delivery through data and digital technologies. EdTech creates new connections between teachers, students, parents, and broader communities to create learning networks. EdTech translates into six main topics:

- Learning continuity and acceleration using an online platform, remote, blended, or adaptive learning
- Teacher development concerning digital skills
- Skills development to support students, teachers, administrators, and households in developing critical skills
- Learner-centered technology to improve learning experience using virtual or augmented reality (VR/AR), gaming, and assistive technologies
- System level support to improve educational management information systems to inform decision making
- Digital infrastructure to promote enabling infrastructure conditions for learning continuity and acceleration.

The GP also hosts Technology and Innovation in Education Global Solutions Group (GSG) to accumulate knowledge and good practices around emerging innovations in the education sector.

Notes

1. https://www.worldbank.org/en/data/interactive/2022/08/22/digital-government-readiness-assessment-dgra-toolkit
2. See the Digital Economy for Africa Initiative (https://www.worldbank.org/en/programs/all-africa-digital-transformation/country-diagnostics);
3. The Digital Economy Initiative for Latin America and aribbean https://www.worldbank.org/en/programs/de4lac/strategy
4. https://www.worldbank.org/en/programs/govtech/gtmi
5. https://collaboration.worldbank.org/content/sites/collaboration-for-development/en/groups/city-planning-labs.html
6. https://collaboration.worldbank.org/content/usergenerated/asi/cloud/attachments/sites/collaboration-for-development/en/groups/city-planning-labs/documents/jcr:content/content/primary/blog/_manual_cpl_municipalspatialdatainfrastructure-2Rxa/MSDI_Manual.pdf
7. https://blogs.worldbank.org/water/5-potential-benefits-integrating-icts-your-water-and-sanitation-projects
8. https://www.worldbank.org/en/programs/global-water-security-sanitation-partnership
9. https://www.worldbank.org/en/topic/water/publication/utility-of-the-future
10. https://worldbankgroup.sharepoint.com.mcas.ms/sites/socialCESA/SitePages/PublishingPages/Digital-CE-05272021-224008.aspx
11. https://spatialagent.org/KIDS/
12. https://openknowledge.worldbank.org/entities/publication/e9b250b5-f560-523a-9328-ec90e8b2a29a
13. https://edgebuildings.com
14. https://apexcities.com/

6 Next Steps for WBG Smart City Engagement

Smart cities plan and manage city functions in an integrated manner through effective use of data and digital technology, which increase in sophistication and interconnectivity over time, thereby facilitating optimization and automation of city functions.

GSCP has engaged in smart city development by supporting WBG teams and clients in their strategic planning and investment design and implementation. GSCP implementation and WBG-wide initiatives indicate the centrality of data and digital technology across sectors but the key challenge, which can be turned into a success factor, is to integrate components between:

- Digital and urban strategies
- Digital and analogue—institutional and human—parts of city governments
- Government-led and citizens and business-led initiatives
- National and local level initiatives
- Sectoral initiatives
- Strategic planning upstream and bankable or implementable projects downstream

Some of the challenges with smart city development are more systemic on the city and WBG side and require high level commitments to institutional reform and change management. Some of the important recommendations are often beyond the remit of influence by individual WBG teams as well as GSCP as a program: that is to mainstream digital development as a crosscutting theme in a country strategy and portfolio and breaking silos in project design and implementation to synergize urban with digital and bring multisectoral interventions from a city perspective.

Based on five years of GSCP engagement experiences, this guidance note proposes that WBG support going forward focuses on concrete actions to help WBG teams and clients to break out of a pattern whereby repetitive strategic planning and silo investments do not lead to transformative results. Proposing relatively small scale but solid actions for an incremental change may not come across as ambitious and transformative enough—especially when the expectation has been digital technologies enabling developing cities to leapfrog and advance at par with advanced one.

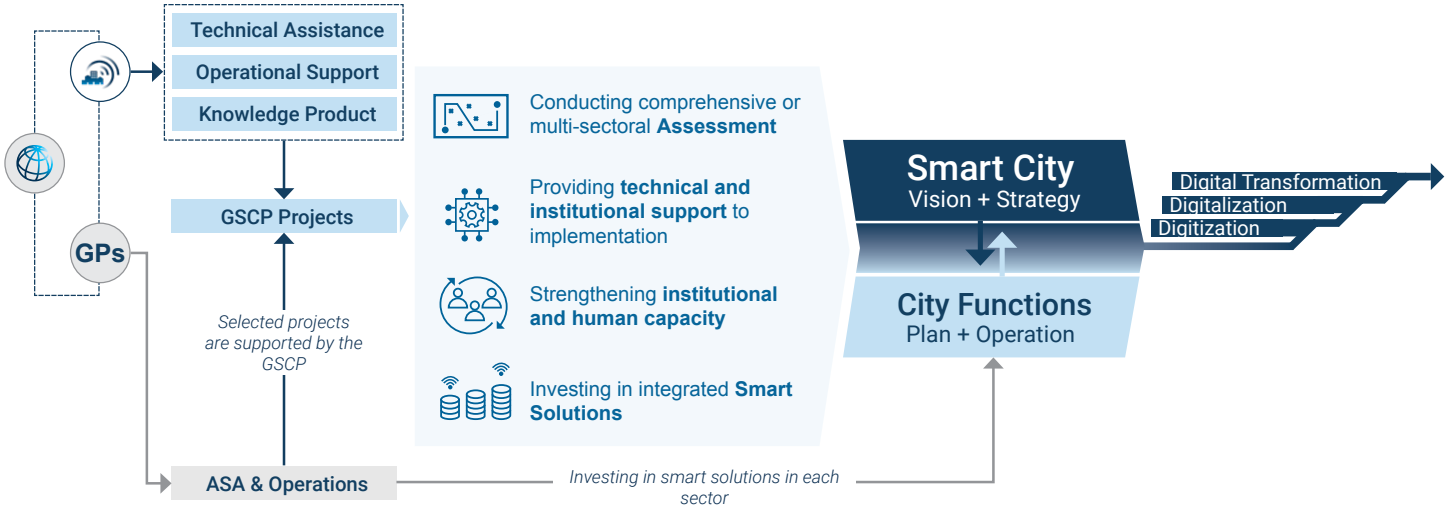
Yet, the proposed approach is not to accept the modus operandi because the key underlying assumption is that concrete actions at the WBG team level where policy and investment dialogue will continue can add up to institute a broader change over time. GSCP implementation experience highlights what such key opportunities may be.

- Assessments are essential and highly on demand for strategic and investment planning. A more holistic, multisectoral assessment can help WBG teams and clients better understand and improve the broader institutional and operational environment around data and digital technologies within cities and nationally.
- The World Bank invests heavily in developing an information system that can serve and improve specific city functions. System development in a sector offers a concrete opportunity for exploring the possibility of bringing data and other related systems together and can benefit from a multisectoral assessment.

- Hands-on technical and institutional support to implement is crucial to develop an integrated system on data standards, data sharing protocols, system architecture, cyber security, technology curation, application and procurement, and system maintenance and upgrade.
- Strengthening institutional and human capacity is a crosscutting factor contributing to deeper integration of city functions and management.

The theory of change (figure 6.1) describes where WBG can come in with the existing initiatives and tools introduced in Section 5 and join forces to increase the chance of building smart cities in developing countries.

Figure 6.1 Proposed theory of change for smart city development.



Source: Authors' own creation (2023).

Engaging in policy dialogue or project preparation early on is important to introduce and advance the smart city agenda, particularly because it takes time to assess and engage stakeholders across sectors to arrive at meaningful investment strategies and priorities. GSCP has met WBG teams' early engagement needs, filling the niche that is often not supported by other programs, which usually request concrete investments are already in place. In the next phase of GSCP, this will be strengthened further by applying a sector wide or cross-sectoral digital, institutional, and human capacity assessment to upstream and downstream engagements.

Appendix A. GSCP Portfolio

NO	ROUND	EOI TITLE	WBG PROJECT/ENGAGEMENT	PROJECT CODE	COUNTRY	REGION[1]	GP[2]	PROJECT TYPE[3]
1	1	Competitive Cities and more enabling business environment (TF) & South African Urban RAS (II)	Business Environment and Competitive Cities (P160668); South Africa RAS for Infrastructure Investment and Integrated Urban Development (P163422)	P160668	South Africa	AFE	FCI	ASA
2	1	Kinshasa Urban Development Project	Kinshasa Multisectoral Development and Urban Resilience Project	P171141	Democratic Republic of the Congo	AFE	URL	IPF
3	1	Potential RAS on Smart City Astana Development following a recent request from Astana Mayor Office	Potential RAS on Smart City Astana Development following a recent request from Astana Mayor Office	N/A	Kazakhstan	ECA	DD	RAS
4	1	Western Balkans Urban Partnership Program	Western Balkans Urban Partnership Program (UPP)	P165780	Serbia	ECA	URL	ASA
5	1	Morocco Municipal Performance Program	Municipal Performance Program	P168147	Morocco	MNA	URL	PforR
6	1	City Institutional Strengthening Program IIII	City Institutional Strengthening Program IIII (Madinah)	P168709	Saudi Arabia	MNA	URL	ASA
7	1	Digital CASA - Uzbekistan	Digital CASA - Uzbekistan (Tashkent)	P166615	Uzbekistan	ECA	DD	IPF
8	1	Third Municipal Development Project (MDP3)	GZ-Third Municipal Development Project	P159258	West Bank and Gaza	MNA	URL	IPF
9	2	Benin Competitiveness and Investment Project	Benin Competitiveness and Investment Project	N/A	Benin	AFW	FCI	PforR
10	2	Zanzibar City Innovation Lab	Boosting Inclusive Growth for Zanzibar: Integrated Development Project	P165128	Tanzania	AFE	URL	IPF
11	2	Vietnam Scaling up Urban Upgrading Project	Vietnam Scaling up Urban Upgrading Project	P159397	Vietnam	EAP	URL	IPF
12	2	Smart villages to support Kosovo's digital economy	Kosovo Digital Economy (KODE)	P164188	Kosovo	ECA	DD	IPF
13	3	National Urban Development Project (NUDP)	National Urban Development Project (NUDP)	P163896	Indonesia	EAP	URL	IPF
14	3	Digital CASA - Tajikistan (Dushanbe)	Tajikistan Digital Foundations Project (Phase 1 of Digital CASA - Tajikistan)	P171382	Tajikistan	ECA	DD	IPF
15	3	Digital CASA (Central Asia-South Asia) regional program	Digital CASA - Kyrgyz Republic; Digital CASA - Uzbekistan; Digital CASA - Tajikistan; Kazakhstan Digital Platforms & Data Economy	P160230; P166615; P171437; P168048	Kyrgyzstan, Uzbekistan, Tajikistan, and Kazakhstan	ECA	DD	IPF
16	3	Zaporizhzhia Smart City	Zaporizhzhia Smart City	43181(IFC)	Ukraine	ECA	URL	IPF
17	3	KSA SMNUR-2: SAUDI ARABIA URBAN DEVELOPMENT AND MANAGEMENT PROGRAMMATIC RAS (Pillar 4)	KSA SMNUR-2: Saudi Arabia Urban Development and Management Programmatic RAS	P172246	Saudi Arabia	MNA	Gov	IPF
18	4	Integrated Urban Development and Resilience Project for Greater Antananarivo	Integrated Urban Development and Resilience Project for Greater Antananarivo	P159756	Madagascar	AFE	URL	IPF

NO	ROUND	EOI TITLE	WBG PROJECT/ENGAGEMENT	PROJECT CODE	COUNTRY	REGION[1]	GP[2]	PROJECT TYPE[3]
19	4	Technical Support for Smart City/Technology-Driven COVID-19 Response	Technical Support for Smart City/Technology-Driven COVID-19 Response	N/A	South Africa	AFE	Multi GPs	IPF
20	4	Dhaka North Neighborhood Upgrading Project (DNNUP)	Dhaka North Neighborhood Upgrading Project (DNNUP)	P173022	Bangladesh	SAR	URL	IPF
21	4	Program to Accelerate Agrarian Reform (One Map Project)	Program to Accelerate Agrarian Reform (One Map Project)	P160661	Indonesia	EAP	URL	IPF
22	4	Moldova: Adapting Chisinau's Public Transport to COVID-19	Moldova: Adapting Chisinau's Public Transport to COVID-19	N/A	Moldova	ECA	Transport	N/A
23	4	Serbia: Green Local Infrastructure Project	Serbia Local Infrastructure and Institutional Development Project	P174251	Serbia	ECA	Transport	IPF
24	4	FY21 Russia ASA : Smart Regions and Smart Cities	Russia Smart Cities	P174545	Russia	ECA	DD	ASA
25	4	Designing a Smart City Strategy and Action Plan for Medellin, Colombia	Designing a Smart City Strategy and Action Plan for Medellin, Colombia	N/A	Colombia	LAC	IFC	N/A
26	4	Smart Cities and Artificial Intelligence (SCAI) Program	Kazakhstan Smart Cities and Artificial Intelligence (SCAI) Program	P170270	Kazakhstan	ECA	Multi GPs	PforR
27	4	KSA SMNUR-2: Saudi Arabia Urban Development and Management Programmatic RAS - Pillar 1	KSA SMNUR-2: Saudi Arabia Urban Development and Management Programmatic RAS	P172246	Saudi Arabia	MNA	URL	IPF
28	4	Bangladesh Local Government COVID-19 Response and Recovery Project	Local Government COVID-19 Response & Recovery Project	P174937	Bangladesh	SAR	URL	IPF
29	5	Smart City Conceptualization for Egypt's New Urban Community Development	Egypt: New Urban Community Development Technical Assistance	P178659	Egypt	MNA	URL	ASA
30	5	Supporting the Smart City agenda of Izmir, Turkey	Izmir Smart City	605421 (IFC)	Turkey	ECA	IFC	Advisory
31	5	Chennai Urban Data Platform	Chennai City Partnership: Sustainable Urban Services Program	P175221	India	SAR	Transport	PforR
32	5	Upstream assessment of smart cities readiness for Ghanaian cities	Sustainable Cities in Ghana ASA	P176999	Ghana	AFW	URL	ASA
33	5	Toward a smarter and greener Amman	(a) Amman Bus Rapid Transit (BRT) Phase II; (b) MENA Vibrant Cities (WB URL, active ASA); (c) MENA Cities Platform (IFC)	P176451; P176356; 604246 (IFC)	Jordan	MNA	Multi GPs	IPF; ASA
34	5	Technical Assistance to Uganda - Physical Planning and Urban Management Information System	Uganda Support to Municipal Infrastructure Development Program - Additional Financing	P163515	Uganda	AFE	URL	PforR
35	5	Introducing Smart City Lab to Burundi	Urban Resilience Project	P177146	Burundi	AFE	URL	IPF
36	5	Buffalo Municipality Smart City Strategy (BCMM)	South Africa RAS for Infrastructure Investment and Integrated Urban Development	P163422	South Africa	AFE	Multi GPs	ASA
37	5	Ulaanbaatar Intelligent Transport Systems	Ulaanbaatar Sustainable Urban Transport (USUT) Project	P174007	Mongolia	EAP	Transport	IPF

NO	ROUND	EOI TITLE	WBG PROJECT/ENGAGEMENT	PROJECT CODE	COUNTRY	REGION[1]	GP[2]	PROJECT TYPE[3]
38	5	Indonesia National Affordable Housing Program -Support for the Development of HREIS	National Affordable Housing Program (NAHP)	P154948	Indonesia	EAP	URL	IPF
39	6	Ethiopia: Integration of Land Information Systems	Ethiopia: ICT Systems for Urban Property Registration and Integration of Land Information Systems	P177655	Ethiopia	AFE	URL	IPF
40	6	Support for Urban Services Subcomponent Design of Tajikistan Digital Foundations Project	Tajikistan Digital Foundations Project	P171382	Tajikistan	ECA	DD	IPF
41	6	Toward smarter urban mobility in Rabat	Morocco Urban Transport Program-for-Results (PforR)	P149653	Morocco	MNA	Transport	PforR
42	6	El Salvador Citizen Engagement and GRM Digital Platform	Local Economic Resilience Project	P169125	El Salvador	LAC	Multi GPs	IPF
43	7	Applying smart city approaches to the reconstruction of Agdam	Support for Recovery and Peacebuilding in Azerbaijan	P178124	Azerbaijan	ECA	SSI	ASA
44	7	Smart Mobility and Accessibility for Dhaka	Integrated Corridor Management Dhaka North Project	P177702	Bangladesh	SAR	Transport	IPF
45	7	Dodoma Smart and Integrated Data Platform Development	Dodoma Urban Transport and Decongestion Program	P176623	Tanzania	AFE	Transport	IPF
46	7	Smart Mobility Solutions to Improve Urban Mobility in Nairobi Metropolitan Area	Kenya Urban Mobility Improvement Project	P176725	Kenya	AFE	Multi GPs	IPF
47	7	Rio de Janeiro Smart, Green and Resilient Urban Mobility	Rio de Janeiro Adjustment and Sustainable Development Policy Loan	P178729	Brazil	LAC	Transport	DPF
48	7	Advisory Support to the Municipality of Ulaanbaatar on Open data, data Analytics, and Urban Information Management Systems	Advisory Support to the Municipality of Ulaanbaatar on Open Data, Data Analytics, and Urban Information Management Systems	606096 (D2D Mongolia 2)	Mongolia	EAP	IFC	Advisory
49	7	Smart and Inclusive Urban Mobility Project	Smart and Inclusive Urban Mobility Project	P176451	Jordan	MNA	URL	IPF
50	7	Building Smart Systems to Improve Affordable Housing Supply in Punjab, Pakistan	Punjab Affordable Housing Program (PAHP)	P173663	Pakistan	SAR	URL	PforR

Notes

1. AFE: Eastern and Southern Africa; AFW: Western and Central Africa; EAP: East Asia Pacific; ECA: Europe and Central Asia; LAC: Latin America and the Caribbean; MNA: Middle East and North Africa; SAR: South Asia

2. DD: Digital Development; FCI: Finance, Competitiveness and Innovation; GOV: Governance; IFC: International Finance Corporation; URL: Urban, Disaster Risk Management, Resilience, and Land, SSI: Social Sustainability and Inclusion.

3. IPF = Investment Project Financing; PforR = Program for Results; ASA = Advisory Services and Analytics; DPF = Developing Policy Financing

Appendix B. Smart City Definitions

INSTITUTION	SMART CITY DEFINITION
International Organization for Standardization (ISO) **(37122: 2019)**	A city that increases the pace at which it provides social, economic, and environmental sustainability outcomes and responds to challenges such as climate change, rapid population growth, and political and economic instability. It fundamentally improves how it engages society, applies collaborative leadership methods, works across disciplines and city systems, and uses data information and modern technologies to deliver better services and quality of life to those in the city (residents, businesses, visitors), now and for the foreseeable future, without unfair disadvantage of others or degradation of the natural environment.
International Telecommunication Union (ITU) **(ITU-T Y.4900)**	A smart sustainable city is an innovative city that uses ICT and other means to improve quality of life, efficiency of urban operation and services and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social, environmental, as well as cultural aspects.
British Standards Institution (BSI) **(PAS 180:2014)**	"Smart cities" is a term denoting the effective integration of physical, digital, and human systems in the built environment to deliver a sustainable, prosperous, and inclusive future for its citizens.
Korea Smart City Act (2018)	The term "smart city" means a sustainable city wherein various city services are provided based on city infrastructure constructed by converging and integrating construction technologies, information, and communications technologies, etc. to enhance its competitiveness and livability.
European Commission	A smart city is a place where the traditional networks and services are made more efficient with the use of digital and telecommunication technologies, for the benefit of its inhabitants and businesses[1]
Smart Cities Council[2]	A smart city is one that has digital technology embedded across all city functions.
Organisation for Economic Co-operation and Development (OECD)	Smart cities are "initiatives or approaches that effectively leverage digitalization to boost citizen well-being and deliver more efficient, sustainable, and inclusive urban services and environments as part of a collaborative, multi-stakeholder process."[3]
United Nations	A smart city "makes use of opportunities from digitalization, clean energy, and technologies, as well as innovative transport technologies, thus providing options for inhabitants to make more environmentally friendly choices and boost sustainable economic growth and enabling cities to improve their service delivery."[4]
Inter-American Development Bank	A smart and sustainable city is defined as "an innovative city that uses ICT and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social, and environmental aspects."[5]

Notes

1. European Commission. (2014). Digital Agenda for Europe: Rebooting Europe's Economy. *European commission.*
2. The Smart Cities Council is an industry coalition formed to accelerate the move to smart, sustainable cities and provides case studies, commentaries, and resources to help guide communities to better outcomes for their residents (https://www.smartcitiescouncil.com/)
3. OECD. (2019). Enhancing the Contribution of Digitalisation to the Smart Cities of the Future. https://www.oecd.org/cfe/regionaldevelopment/Smart-Cities-FINAL.pdf
4. United Nations. (2017). New Urban Agenda. https://habitat3.org/wp-content/uploads/NUA-English.pdf
5. Bouskela, M., Casseb, M., Bassi, S., De Luca, C., and Facchina, M. (2016). The Road toward Smart Cities: Migrating from Traditional City Management to the Smart City. Inter-American Development Bank (IDB).

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