



# Advancing the Potential of Indonesia's Smart City

December 2024

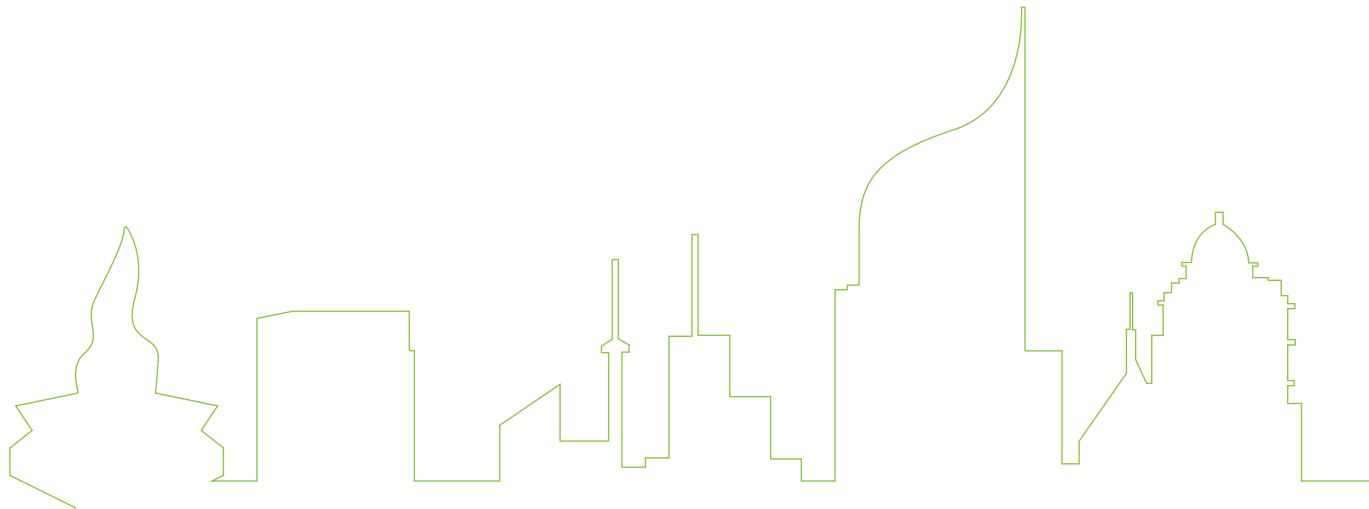




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An aerial photograph of the Tugu Pahlawan (Heroes Monument) in Jakarta, Indonesia. The monument is a tall, slender, white column topped with a golden flame, standing on a large, circular, multi-tiered base. The monument is surrounded by a wide, green lawn and a paved road. In the background, a dense urban skyline is visible under a clear blue sky.

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# Foreword

The concept of the "smart city" has come to light as a promising solution to the numerous challenges associated with modern urban living. The shift to a smart city offers an innovative approach to the challenges that cities face today, including energy consumption, traffic congestion, and environmental sustainability. With the use of cutting-edge technologies – such as artificial intelligence (AI), the Internet of Things (IoT), big data, and renewable energy, the smart city framework is aimed at creating urban settings that are more resilient, efficient, and responsive to the demands of their residents.

As Indonesia marches into a new frontier in urban development, the insights shared by our experts are invaluable. They offer frameworks for stakeholders to take note of for better smart city development in Indonesia. Additionally, our experts unravel the opportunities for investing in smart city in Indonesia – along with the financing schemes opportunities – that we hope may help stakeholders build a better future for urban life in Indonesia; a future where cities can demonstrate their authentic appeal, and are not only smarter but also more humane, equitable, environmentally friendly, habitable, and connected.

We express our appreciation to all the contributors who have shared their knowledge and enthusiasm in this publication. The goal of this publication is to serve as a resource for investors, policy makers, urban planners, and the people. It looks at the social, economic, and ethical ramifications of these breakthroughs in addition to the technological underpinnings of smart cities. Readers will gain an in-depth understanding of the significance of smart cities for Indonesia and how they may improve people's quality of life, promote inclusive growth and sustainable development through an integrated approach that combines expert analysis and case study examples.

We welcome you into the journey of smart city transformation, which promises to change the way we work, live, and engage with our surroundings!

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# Indonesia's Smart City Journey

The term “smart city” may bring to mind the idea of a sci-fi utopia, but it is simply one that uses technology to improve outcomes across every aspect of city operations and enhance the services it offers to its residents. It collects and uses data to drive its decision-making, and creates networks of partners among governments, businesses, non-profits, and community groups to expand and improve its ability to serve its residents.

Since their introduction in the mid-2000s, such smart city concepts have been gaining momentum across many of Indonesia's cities. One of the most pivotal moments in Indonesia's smart city journey came in 2017, when the Ministry of Communications and Informatics (MoCI) launched its ambitious 100 Smart Cities Movement setting out its vision to establish 100 smart cities by 2045. This policy direction had the effect of spurring the mushrooming of various smart city pilot projects across the archipelago in areas such as e-government, economic growth, and environmental sustainability. By 2022, nearly 200 districts or cities across Indonesia have developed smart city master plans, up from merely 25 in 2017.<sup>1</sup>

Notably, the Special Region of Yogyakarta has since achieved the remarkable feat of having all of its regencies and cities successfully develop smart city master plans. Consequently, Yogyakarta was selected in 2023 as the pilot for a smart province.<sup>2</sup> This initiative is

expected to lay the groundwork for the province to improve the quality and transparency of its public services and align its economic development model with the 17 United Nations Sustainable Development Goals (UN SDGs).

Similar initiatives are also underway in regions such as Bali, which is in the midst of realising its smart island concept through the implementation of smart city concepts across its six districts, as well as the ongoing construction and development of Nusantara Capital City or Ibu Kota Negara Nusantara (IKN Nusantara), which is set to become the world's first sustainable capital city when it commences operations.

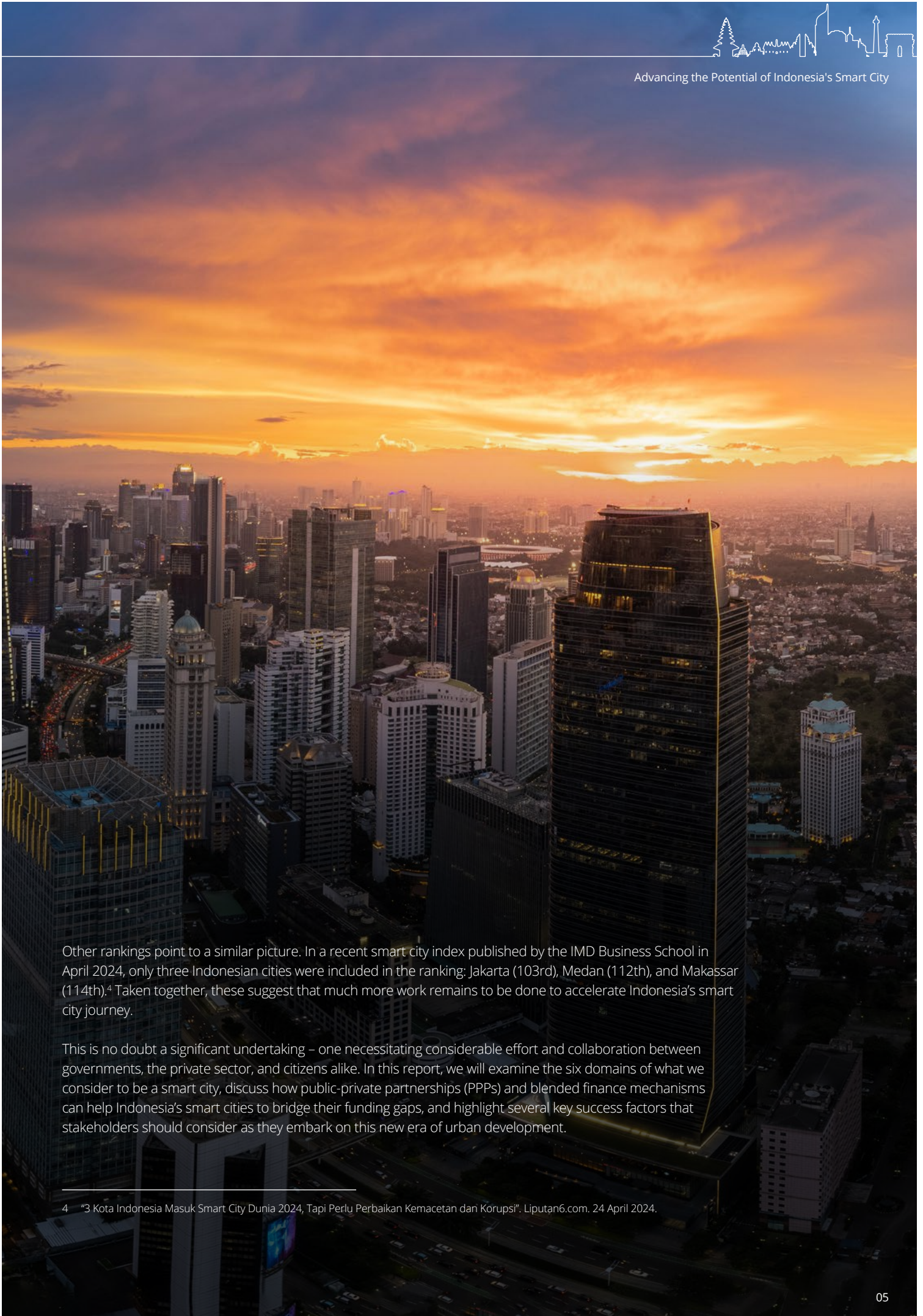
Despite the remarkable progress that has been achieved over the past few decades, however, a series of evaluations conducted by Institute of Technology Bandung's Centre for Smart City & Community Innovation in 2015, 2017, 2019, and 2021 have indicated that no Indonesian smart city has yet reached a sufficiently mature developmental stage to truly be considered a smart city. Specifically, on a scale of 1 to 5 where 1 is the least mature and 5 is the most mature, most cities are assessed to only be at Level 4, where the integration of their smart city infrastructure remains a work in progress and has not yet been optimised and fully integrated.<sup>3</sup>

1 “Indonesia Targets 50 Cities to Become Smart City in 2023”. Tempo.co. 3 December 2022; “25 Kota Perintis Smart City”. Indonesiabaik.id.

2 “Menuju Smart Province, Ditjen Aptika Tandatangani Nota Kesepakatan dengan Pemda DIY”. Directorate General of Informatics Applications (Ditjen Aptika) Ministry of Communication and Informatics of RI. 13 July 2023.

3 Prof. Suhono Harso Supangkat (Director of Smart Cities and Communities Innovation Center, Institut Teknologi Bandung (ITB)). Online interview with Deloitte in Indonesia. 24 July 2023.





Other rankings point to a similar picture. In a recent smart city index published by the IMD Business School in April 2024, only three Indonesian cities were included in the ranking: Jakarta (103rd), Medan (112th), and Makassar (114th).<sup>4</sup> Taken together, these suggest that much more work remains to be done to accelerate Indonesia's smart city journey.

This is no doubt a significant undertaking – one necessitating considerable effort and collaboration between governments, the private sector, and citizens alike. In this report, we will examine the six domains of what we consider to be a smart city, discuss how public-private partnerships (PPPs) and blended finance mechanisms can help Indonesia's smart cities to bridge their funding gaps, and highlight several key success factors that stakeholders should consider as they embark on this new era of urban development.

<sup>4</sup> "3 Kota Indonesia Masuk Smart City Dunia 2024, Tapi Perlu Perbaikan Kemacetan dan Korupsi". Liputan6.com. 24 April 2024.





# What Makes a City Smart?

Urbanisation in Indonesia has been on a rapid rise in recent decades. Approximately 58% of the population in Southeast Asia's most populous economy reside in urban areas as of 2022, and this number is expected to reach 73% by 2045 on the back of increasing rural-urban migration.<sup>5</sup> For many urban centres across Indonesia, this means that they may be set to experience a significant exacerbation of existing urban challenges, such as traffic congestion, pollution, energy shortages, and waste management.

As cities seek to develop responses to these pressing challenges, cities across Indonesia are increasingly embracing smart city concepts to transform their urban environments into more liveable, sustainable, and efficient spaces. To do so, cities are turning to innovative solutions and digital infrastructure backed by data and advanced technologies such as Internet of Things (IoT), artificial intelligence (AI), and data analytics to optimise resource management, streamline public services, and develop responsive infrastructure.

Nevertheless, while digital technology and infrastructure are two key cornerstones of any smart city, it is ultimately the people who must be at the heart of this transformation. There are two reasons for this: fundamentally, the transformation must serve to advance and elevate the quality of life for a city's residents; equally, the transformation must also be driven by a city's residents, whether

it is through their participation in social and economic activities or engagement in community-level initiatives.<sup>6</sup>

In this section, we will delve deeper into the six domains of what we consider to be a smart city – namely, smart economy; smart environment; smart government; smart living; smart mobility; and smart security (see Figure 1), and briefly discuss Indonesia's progress in each of them. It is important to bear in mind, however, that as smart cities are designed to tackle specific urban challenges, their form, function, and configuration could vary significantly from city to city.

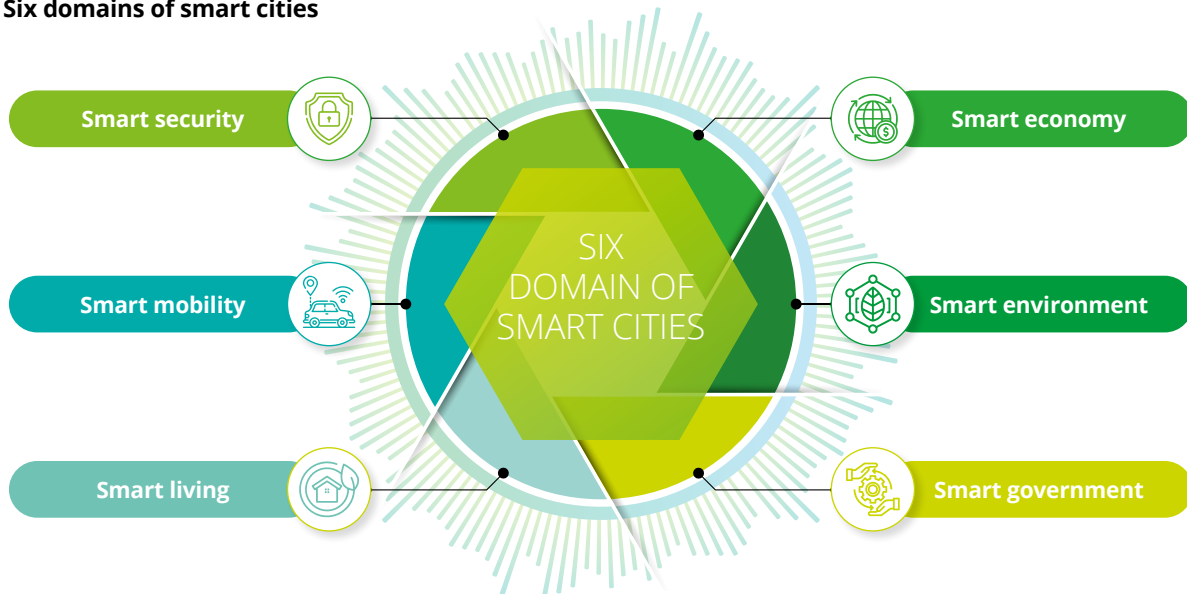
Within the specific context of Indonesia, it is also worthwhile highlighting that from a broader economic perspective, smart city concepts are highly compatible with Indonesia's national objectives for digital transformation. Efforts to advance the implementation of the 2021-2024 Digital Indonesia Roadmap developed by MoCI include, for example, the deployment of extensive fibre optic backbone networks, fibre-link and microwave-link networks, telecommunications satellites, and base-transceiver stations, as well as plans to facilitate the onboarding of 30 million micro, small, and medium-sized enterprises (MSMEs) onto the digital economy – all of which are critical to setting the foundation for the implementation of smart city initiatives and accelerating their adoption.

<sup>5</sup> "Share of the urban population in Indonesia 2013-2022". Statista. 6 August 2023; "Ringkasan Eksekutif Visi Indonesia 2045". Ministry of National Development Planning of RI. May 2019.

<sup>6</sup> Prof. Suhono Harso Supangkat (Director of Smart Cities and Communities Innovation Center, Institut Teknologi Bandung (ITB)). Online interview with Deloitte in Indonesia. 24 July 2023.



Figure 1: Six domains of smart cities



Source: Deloitte analysis.

### 1. Smart economy

A smart economy is defined not only by high levels of productivity and competitiveness, but also an environment that is highly conducive for innovation. It is an economy that embraces new ideas in scientific research, sustainability and environmental preservation, and entrepreneurship – and therefore characterised by constant economic transformation leading to continual improvements in standards of living.

In the context of Indonesia, we have observed the Jakarta Smart City to be in the midst of implementing a series of smart economy initiatives. The Jakpreneur program, for example, is one platform that integrates the city's MSMEs into an entrepreneurial ecosystem, and provides them with resources in the form of marketing assistance, funding, training, and networking opportunities.

Other notable programs also include JakOne Pay, a digital payment system launched in partnership with Bank DKI to support cashless payments, fund transfers, as well as tourism and e-commerce activities; Jaknaker, a career portal that aggregates employment opportunities across the city and provides the public with career development training materials; and JakPangan, a price comparison platform that the public can use to compare prices of staple food items across Jakarta.

### 2. Smart environment

For the smart environment domain to live up to its name, it must not only leverage sensors, IoT, and other digital technologies to alter its physical infrastructure, but also encourage positive resourcing decisions and the uptake of circular economy principles in the areas of energy management, water management, wastewater management, and waste management, amongst others.

Notable developments in this space include, for example, the Quipperian initiative launched in 2020 to implement smart grid technologies across Indonesia. To date, seven cities – specifically, Jakarta, Bandung, Makassar, Surabaya, Semarang, Yogyakarta, and Denpasar – have started leveraging these technologies to manage and optimise their electricity usage.

Fundamentally, however, every smart city must develop its own approach to incorporating the smart environment concept into its overarching framework, taking into consideration its specific environmental concerns, context, and grassroots or community-level solutions. Adopting a highly local approach is essential because environmental challenges – and therefore their solutions – tend to be highly local in nature: in the Klungkung Regency, for instance, the Tempat Olah Sampah Setempat (TOSS) or People's Electric Local Waste Management Site is an initiative that had been launched to convert organic waste into fish feed for the local farming sector.

Other examples also include the DKI Jakarta provincial government's deployment of a series of localised initiatives to operationalise its smart environment objectives. These include, for example, a refuse-derived fuel (RDF) initiative in Bantar Gebang that processes waste into alternative fuel for industrial manufacturers; an information and communication technology (ICT)-based flood control system that accurately predicts flooding and informs the development of flood management policies to protect low-lying areas in Jakarta; and the Sampah Tanggung Jawab Bersama (Samtama) initiative that focuses on reducing, reusing, and recycling waste.



### 3. Smart government

Apart from enhancing the efficiency of public service delivery through the development and implementation of integrated and transparent electronic-based government systems, one key objective of the smart government domain is also to foster greater collaboration between the government and community in the planning, socialisation, and implementation of public initiatives.

To achieve this, a number of cities and provincial governments in Indonesia have launched smart city mobile applications to centralise resident access to city services and acclimatise them to broader smart city concepts. Examples of such applications include, but

are not limited to, Jakarta's JAKI super-app (see sidebar for more information on the JAKI super-app) and Bandung's Sadayana Smart City application.

The latter, in particular, not only enables residents in Bandung to apply for permits, pay taxes, and report problems related to public facilities; track public transportation in real-time and plan their routes; and access emergency services, such as the police and civil defence; but also allows them to participate in various city government initiatives, such as casting votes for city projects and providing feedback on city services.<sup>7</sup>

#### JAKI, the one-stop super-app for the Jakarta Smart City

Launched in 2019, the JAKI super-app represents a significant stride in the digitisation of public services in Jakarta. As a comprehensive digital ecosystem, JAKI integrates over 60 features and 150 applications to seamlessly transform the delivery of public services to citizens. Key applications supported by the JAKI super-app include, but are not limited to:

- Economic empowerment: Apart from the aforementioned Jakpreneur program, other applications available on the JAKI super-app include JakEvo, an integrated licencing platform that simplifies the process for businesses and proprietors to obtain business and other operational licences.
- Public transportation: Designed to enhance the use of the public transportation system, JakLingko is an application that provides an integrated payment system across all modes of public transportation.
- Flood control management: JakPantau is an application that enables Jakarta residents to obtain information on the latest flood points across the city.
- Emergency response: To support rapid emergency response, the JAKI super-app also provides quick access to a curated list of essential contacts for emergency response, covering medical crises, security issues, natural disasters, and personal safety threats.

### 4. Smart living

The smart living domain entails the use of digital technology to raise standards of living while emphasising efficiency, security, and safety in both public and private spaces. In Indonesia, the implementation of smart city concepts focusing on lifestyle and health has seen the launch of various innovative projects designed to enhance the quality of life and well-being of residents.

These include, for example, DKI Jakarta's Jakarta One Card or Kartu Pintar that allows citizens to pay for transport, road tolls, insurance, and shopping; a city surveillance system comprising more than 6,000 closed-circuit television (CCTV) cameras to monitor traffic and crowds; and a global positioning system (GPS) system for waste

trucks to track their locations in real-time around the clock.<sup>8</sup> In Jakarta, the city also leverages data analytics to better predict and respond to health emergencies and improve service delivery in local hospitals and clinics.<sup>9</sup>

### 5. Smart mobility

Smart mobility is as much about bits and bytes as it is about the physical infrastructure that residents walk, drive, and ride on in a smart city. Across Indonesia, growing metropolitan populations in many urban centres are putting a strain on transportation networks. As a first step to alleviate congestion, cities such as DKI Jakarta are implementing transportation hubs and actively encouraging greater uptake of public transportation and other greener modes of transportation.

7 "Sadayana, Rumah Layanan Digital Kece Milik Kota Bandung". Diskominfo Kota Bandung. 9 March 2022.

8 "Cara Akses CCTV Jakarta, Ini Situs untuk Pantau Demonstrasi hingga Banjir". SmartCityIndo. 9 October 2020.

9 "How Big Data and AI saved lives in Indonesia". UNICEF. 7 July 2022.





The Transjakarta terminal in DKI Jakarta, for example, is a hub that connects the various commuter line trains and bus lines to facilitate transfer between different modes of transportation. To transform Jakarta into a more pedestrian-friendly city, the provincial government also recently carried out a large-scale revitalisation of 265 kilometres of sidewalks across the city to widen them for pedestrians and include special lanes for cyclists and persons with disabilities. These sidewalks are, in turn, integrated into existing public transportation networks such as Transjakarta to facilitate multimodal commutes.

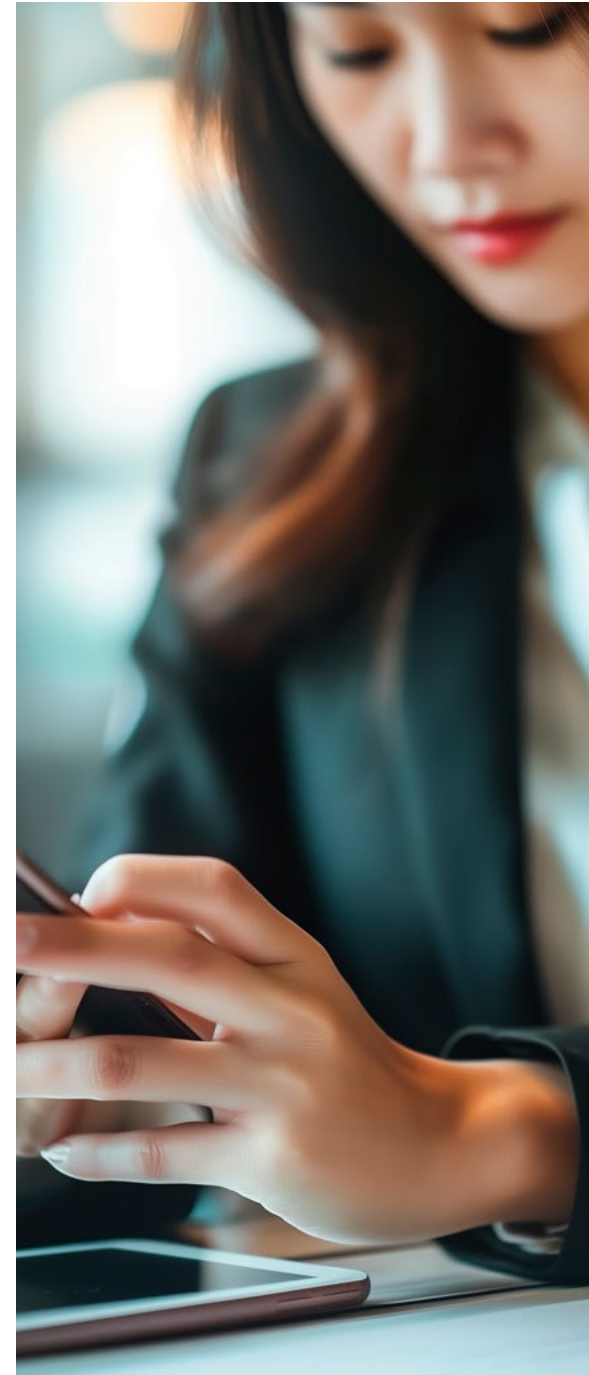
Looking ahead, however, truly achieving smart mobility will not only require advanced networks of multimodal transportation infrastructure, but also greater harmonisation between the different modes of transportation, urban development, citizen readiness, and digital technologies. Realising such a concept, referred to by the Masyarakat Transportasi Indonesia (MTI) or Indonesian Transportation Society as 'Smart-Mobility-Urban-Society' (S-MUS), implies the need for Indonesia's smart cities to better integrate all of their disparate technological innovations – including but not limited to digital toll payment systems, intelligent toll road systems, adaptive traffic management systems, speed monitoring, parking access control, and autonomous public transport systems – into more cohesive mobility ecosystems.

## 6. Smart security

As crime becomes smarter and high-tech, public safety and security agencies must match up by leveraging digital technology and data to enhance the safety and security of residents and infrastructure. Highlights of smart security initiatives currently underway across Indonesia include Jakarta's recent smart lighting upgrade, where more than 90,000 streetlights were equipped with energy-efficient LED bulbs and connected to remote management software that enables city officials to remotely adjust illumination levels to meet specific district needs in response to factors such as traffic congestion.

Meanwhile, in Semarang, the Libas police reporting application also enables residents to report crimes without having to visit a police station, while in Yogyakarta, residents are also able to access and view CCTV footage in real-time to identify suspected criminal activities on the Jogja Smart Service (JSS) website and application.<sup>10</sup>

Beyond facilitating the activities of enforcement agencies, however, the smart security domain also entails protecting a smart city's data from cyberattacks. Given that much of a smart city's operations depends on the collection and storage of vast amounts of big data, there is therefore the need for cities to put in place clear data governance frameworks and invest in the development of secure data platforms and smart access controls.



<sup>10</sup> "Aplikasi Libas-Kenita, Mbak Ita: Bisa Lapor Kejahatan dan Pertolongan Bencana Alam". Semarang City Government. 9 November 2023; "Jogja Smart Service". Yogyakarta City Communication, Informatics and Encryption Office.



### **Nusantara New Capital (Smart) City: User-Centred Development**

Nusantara (IKN) Smart City is envisioned to become a “World Class City for All,” driven by three strategic objectives: establishing itself as a global sustainable city, a future economic powerhouse for Indonesia, and a symbol of national identity. In its urban and regional development, Nusantara aims to integrate the concepts of a forest city, a sponge city, and a smart city. The pertinent question is: how can a smart city framework facilitate Nusantara in realising its vision and strategic objectives?

The Nusantara Authority (OIKN), in collaboration with Deloitte, has undertaken a rigorous process to pinpoint smart city services and features that would enable Nusantara to achieve its goals and key performance indicators (KPIs) while catering to the needs of its inhabitants. This process encompasses the following activities:

1. **Vision and Objectives Analysis:** Conducting an in-depth examination of Nusantara’s vision, strategic objectives, KPIs, and development timelines. All prospective services and features to be deployed in Nusantara must align with these foundational principles, ensuring they contribute effectively towards meeting the city’s KPIs.
2. **Persona and User Journey Identification:** Mapping out the personas and user journeys for those who will live, work, or visit Nusantara. OIKN and Deloitte have identified eight personas: IKN residents, Public Service Agency (PSA) Officers, the Academic Community, Business Professionals, OIKN Employees, Government Employees, Health Workers, and First Responders. Each persona is distinguished by unique needs, interests, and concerns that smart city services and features must address.
3. **Smart Domain, Services, and Features Identification:** Defining the smart domains, services, and features based on insights from the first two steps. These domains, services, and features will be instrumental in helping Nusantara achieve its vision as a world-class city that meets the diverse needs of all its residents. This step includes detailing the functional and technical specifications for each smart feature.
4. **Enterprise Architecture Development:** Crafting Nusantara’s smart city enterprise architecture. This involves mapping out how all smart features will interconnect within the smart city ecosystem, ensuring seamless integration and interoperability.
5. **Costing and Vendor Selection:** Finalising the list of smart services and features, aligning them with Nusantara’s development timeline, and selecting suitable vendors. This stage ensures a comprehensive understanding of how all smart features will interact within the smart city ecosystem, paving the way for efficient implementation.

By integrating Nusantara’s vision, strategic objectives, and urban development principles with the identified interests and needs of the eight personas, OIKN has published a comprehensive smart city blueprint. This document delineates six key domains (Smart Governance, Transportation & Mobility, Living, Natural Resources & Energy, Industry & Human Resource, and Built Environment & Infrastructure), 21 subdomains, and 67 smart features. This blueprint serves as the foundational framework for developing Nusantara into a world-class smart city.



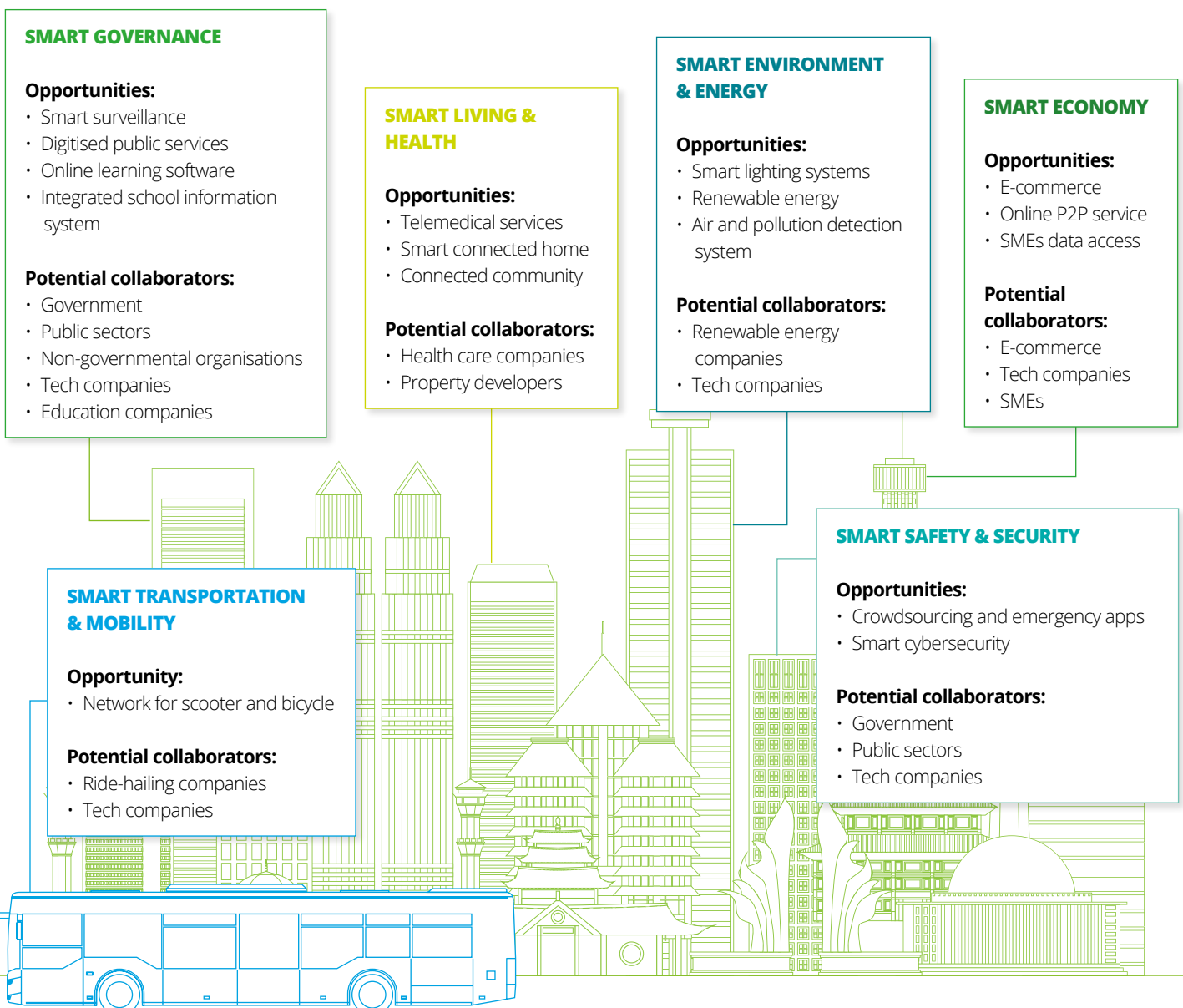


# A Conducive Environment for Private Investment

Given that Indonesia is the largest economy in Southeast Asia and the fourth most populous country in the world, its acceleration towards a new era of urban development is expected to result in the catalysis of numerous investment opportunities for infrastructure development across all six aforementioned domains (see Figure 2).

To this end, private infrastructure investment in the form of PPPs and blended finance mechanisms will be essential. In this section, we will briefly discuss how Indonesia's political and economic stability and high resource endowment help to set the stage for a conducive environment for private investors to finance the development of Indonesia's smart cities.

**Figure 2: Potential investment opportunities across the six domains of smart cities**





### Political and economic stability

Buoyed by resilient household consumption and industrial productivity, Indonesia's Gross Domestic Product (GDP) is expected to grow at a robust rate of about 5.0% in 2024, higher than many of its neighbouring economies, such as Malaysia (4.3%) and Thailand (2.4%).<sup>11</sup> Debt-to-GDP ratio also remains stable at 38.5%, reflecting prudent fiscal management and a commitment by Indonesian government to keeping the ratio well below the statutory limit of 60%.<sup>12</sup>

Looking ahead, Indonesia's strong economic trajectory is expected to continue on the back of widespread expectations of political stability. S&P Global Ratings, for example, affirmed Indonesia's outlook as stable, with private investment forecasted to grow following the slowdown from the 2024 General Election. Smooth transition to the new government and prominent policy continuity is anticipated.<sup>13</sup>

The continuity and stability of long-term projects, such as the construction of the IKN Nusantara, has also been assured by regulation. For instance, Law No. 03/2022 on State Capital (IKN) had been passed to ensure the project's longevity beyond the current government administration. This law, which regulates IKN as a 10-year priority project, obliges the administrations under the 2024-2029 and 2029-2034 terms to continue the development of the new capital city (see sidebar for a more comprehensive list of regulations pertaining to smart cities in Indonesia).<sup>15</sup>

Of note is also the fact that infrastructure development is high on the list of economic priorities for Indonesia. According to the latest Masterplan for Acceleration and Expansion of Indonesia's Economic Development, the government intends to leverage infrastructure development as a key economic driver to attain its goal of becoming one of the world's top economies by 2025, and achieve its longer-term vision of breaking out of the middle-income trap by 2045.

Further indications of Indonesia's commitment to its smart city agenda and infrastructure development are also evident in its appointment as the Chair of the ASEAN Smart City Network (ASCN) in 2023, which is a platform for ASEAN member states to collaborate on initiatives relating to smart and sustainable urban development. Notably, four Indonesian cities – specifically, Banyuwangi, Jakarta, Makassar, and Sumedang – have been included in the list of 31 cities prioritised by ASCN.<sup>16</sup>

### High resource endowment

From an investment standpoint, Indonesia's main appeal lies in its high resource endowment. In the domain of natural resources, it is well-established that Indonesia is in a particularly advantageous position because it has at its disposal an abundance of alternative and green energy resources – including biomass, geothermal power, solar power, and hydropower – that can be harnessed to sustainably power its smart cities. As a mere indication of the potential that it possesses in this regard, Indonesia is home to 23.76 Gigawatts (GW) of geothermal energy potential, 43.3 GW of biomass energy potential, and 94.6 GW of hydro energy potential.<sup>17</sup>

Nuclear power is also an additional option that Indonesia is currently considering, as it possesses substantial uranium and thorium reserves that can be utilised as nuclear fuel.<sup>18</sup> Although Indonesia is geographically located in the Pacific Ring of Fire, initial assessments conducted by National Research and Innovation Agency or Badan Riset dan Inovasi Nasional (BRIN) have also found that several sites in Banten, Jepara, as well as West and East Kalimantan, could potentially be safe and viable for the location of nuclear power plants.<sup>19</sup>

With the dovetailing of Indonesia's smart city ambitions and its commitment to achieving its net-zero emissions targets by 2060, a series of laws and regulations have since been introduced by the government to promote greater investments in green energy development. These include, for example, Perpres No. 112/2022 on the Acceleration of Renewable Energy Development for Electricity Power Provision in Indonesia, as well as tax incentives for the development of green and renewable energy power plants.

Aside from its natural resources, it is worthwhile noting that Indonesia also possesses abundant human resources. Indeed, Indonesia is the fourth most populated country in the world, where more than two-thirds or 69.6% of its population is aged between 15 and 64.<sup>20</sup> This relatively young demographic means that Indonesia is poised to reap a significant demographic dividend in the coming years; according to estimates by Statistics Indonesia (BPS), this dividend is expected to be realised between 2020 and 2035.<sup>21</sup> Nurturing this cohort of the workforce will therefore be critical to ensuring that Indonesia's new era of smart cities will be equipped with the right talent capable of driving their growth and development.

11 "Global Economic Prospects". World Bank. June 2024.

12 "Pembiayaan APBN Tetap On Track: Lindungi Masyarakat dan Jaga Stabilitas". Ministry of Finance of RI. 26 September 2024.

13 "Indonesia Ratings Affirmed At 'BBB/A-2'; Outlook Stable". S&P Global Ratings. 30 July 2024.

14 "Gaet Investasi Rp53,8 Triliun, DKI Masih Menarik Minat Investor". Medcom.id. 23 November 2023.

15 "Pembangunan IKN Wajib Dilanjutkan Presiden 2024-2029 dalam Rencana Revisi Terbaru". Republika. 21 August 2023.

16 "ASEAN Smart Cities Network". Association of Southeast Asian Nations (ASEAN).

17 "Indonesia Energy Transition Outlook 2022". International Renewable Energy Agency (IRENA). 2022.

18 "Indonesia Miliki Potensi Bahan Galian Nuklir yang Cukup untuk Dieksplorasi". Badan Riset dan Inovasi Nasional (BRIN). 16 December 2022.

19 "Dukung Program NZE 2060, Keberadaan PLTN Dinilai Layak Diperhitungkan". Investor.id. 24 October 2022.

20 "Dirjen Dukcapil: Penduduk Produktif 69,58%, Modal Besar Menuju Indonesia Emas". Kumparan.com. 8 August 2024.

21 "Analisis Profil Penduduk Indonesia". Statistics Indonesia (BPS). 24 June 2022.





## Regulations pertaining to the development of smart cities in Indonesia

Recognising Indonesia's pressing need to transform its infrastructure, the government has outlined the following key regulations aimed at fostering the development of smart cities:

**Presidential Regulation No. 18/2020 on the National Medium-Long Term Development Plan**, that identifies the enhancement of ICT infrastructure as a strategic priority to support digital transformation, including the development of smart cities;

**Government Regulation No. 59/2022 on Cities**, that regulates technology development and innovation in the provision of urban service facilities in accordance with security, health, safety, and environmental standards; and

**MoCI Regulation No. 8/2019 on Implementation of Concurrent Government Affairs in the Field of Communication and Informatics**, that empowers regional governments to create ecosystems for smart cities, including the relevant technology, information and communication infrastructure, electronic-based business processes, and related policy, governance, and human resources frameworks.

These foundational regulations are also complemented by several additional laws and regulations:

**Law No. 25/2004 on National Development Planning System**, that governs national development planning systems and regulates the coherence of Indonesia's development plan, including long-term, mid-term, and annual plans developed by national and regional governments;

**Law No. 26/2007 on Spatial Planning as amended by Government Regulation in lieu of Law No. 2/2022**, that requires spatial planning to be carried out with the integration of cross-sectoral, cross-regional, and cross-stakeholder interests;

**Law No. 11/2008 as amended by Law No. 19/2016 on Electronic Information and Transactions (EIT)**, that defines prohibited actions in the use of information and electronic transactions, aligns the provisions of the EIT Law with criminal procedural law, and strengthens the government's role in preventing security issues caused by the misuse of electronic information and transactions, in addition to managing electronic information;

**Law No. 14/2008 on Public Disclosure of Information**, that serves as a facility for the public to observe and scrutinise state and public governance, as well as matters considered important to the public;

**Law No. 25/2009 on Public Service**, that defines clear boundaries and relationships regarding the rights, responsibilities, obligations, and authorities between society and public service providers related to the implementation of public services, and acknowledges the management of both electronic and non-electronic information systems by public service providers as a foundation for e-government;

**Presidential Regulation No. 95/2018 on Electronic-Based Government System**, that requires all levels of government – central, provincial, and municipal – to implement online governance tools such as e-budgeting, e-procurement, and e-planning to enhance budget efficiency, government transparency, and the provision of public services;

**MoCI Regulation No. 5/2020 on Data Centre and Cloud Computing**, that provides guidelines for the construction and operation of data centres and cloud computing services in Indonesia;

**MoCI Regulation No. 14/2016 on Guidelines for Regional Apparatus Nomenclature in the Field of Communication and Informatics**, that manages the governance and organisational structure of regional public servants under the employment of MoCI;

**Government Regulation No. 18/2016 as amended by Government Regulation No. 72/2019 on Regional Apparatus**, that requires the appointment of a regional governing agency to provide basic services to the public;

**Government Regulation No. 80/2019 on Trading through Electronic Systems**, that governs e-commerce activities, including mandatory requirements for business licences, export and import laws, data protection, e-payments, consumer protection, as well as dispute resolution, monitoring, and supervision; and

**Presidential Instruction No. 3/2003**, that instructs ministries, state agencies, and regional heads to formulate e-government development policies and strategies within their respective scopes.



# Financing the Development of Smart Cities

Infrastructure modernisation is a long-term and large-scale endeavour that comes with a hefty price tag that cannot be borne by governments alone. To bridge the funding gap, governments across the globe are turning to a range of innovative financing solutions.

In this section, we will discuss two such financing solutions – PPPs and blended finance mechanisms – that Indonesia is leveraging to mobilise private sector financing for its smart city projects.

It must be emphasised, however, that the role of the private sector in Indonesia's smart city journey is not limited to financing. Through their participation in PPPs and blended finance mechanisms, private investors also bring with them valuable financial, technical, and management know-how, as well as insights into best practices drawn from their participation in other smart city initiatives.

## Public Private Partnerships (PPPs)

Briefly, a PPP aims to increase the efficiency of an infrastructure project by creating a long-term relationship between the public sector partner and a private operator or financier, typically in the form of a procurement contract requiring the latter to deliver a set of defined services to the former. Such a long-term relationship not only provides the government with the necessary project financing, but also provides it with corporate and technical expertise in implementing the project.

In Indonesia, PPPs are primarily deployed to finance infrastructure projects, where they are regulated under Presidential Regulation Number 67 Year 2015 on Public-Private Partnership in Infrastructure setting out guiding principles for the proportional allocation of risk between private and public sector participants for such schemes. PPPs are also backed by the Ministry of Finance, who in addition to supporting project preparation and facilitating feasibility planning activities, is also responsible for providing payment guarantees. Examples of payment guarantees include, for example, the availability payment (AP) scheme that guarantees the disbursement of payments to investors once an infrastructure or service is made

available for use.<sup>22</sup> Under the AP scheme, payment is not based on usage or demand, but is instead made contingent on the facility being in a condition specified in the agreement, thereby shielding the private investor from demand risks.

Therein lies the key benefits of participating in PPPs from a private investor's standpoint: PPPs facilitate risk-sharing between the public and private entity, and government support is typically available at the project preparation phase (see sidebar for more information). In addition, given that the private entity is responsible for funding the initial provision of the infrastructure, it also possesses a certain degree of control over the development of the infrastructure and has the room to innovate to drive greater efficiencies in its service provision.

Nevertheless, despite its many benefits, implementing PPP in smart cities is not without its challenges and risk.

Weak institutional frameworks, political and legal uncertainties, and regulatory failures could undermine PPP effectiveness, and institutions lacking legitimacy, trust, and capability may struggle to manage PPP

22 "Peraturan Menteri Keuangan Nomor 220/PMK.08/2022 Tahun 2022 tentang Dukungan Pemerintah untuk Kerja Sama Pemerintah Dengan Badan Usaha Serta Pembiayaan Kreatif Dalam Rangka Percepatan Penyediaan Infrastruktur di Ibu Kota Nusantara". Ministry of Finance Regulation. 2022.



effectively. Additionally, private entities may lack the incentives to adequately consider safety, equity, community, and environmental impacts, leading to market failures if regulations are inadequate.

Furthermore, the risk and responsibility sharing mechanisms within PPP agreements are important yet challenging to negotiate. Effective risk management requires meticulous planning and clear agreement on how risks are managed throughout the project lifecycle, and both public and private entities must engage in thorough risk identification and management to ensure that each party is aware of and prepared for their responsibilities. This also requires a robust

legal framework, and a strong commitment to supporting the PPP through its entire lifecycle from planning through operation.

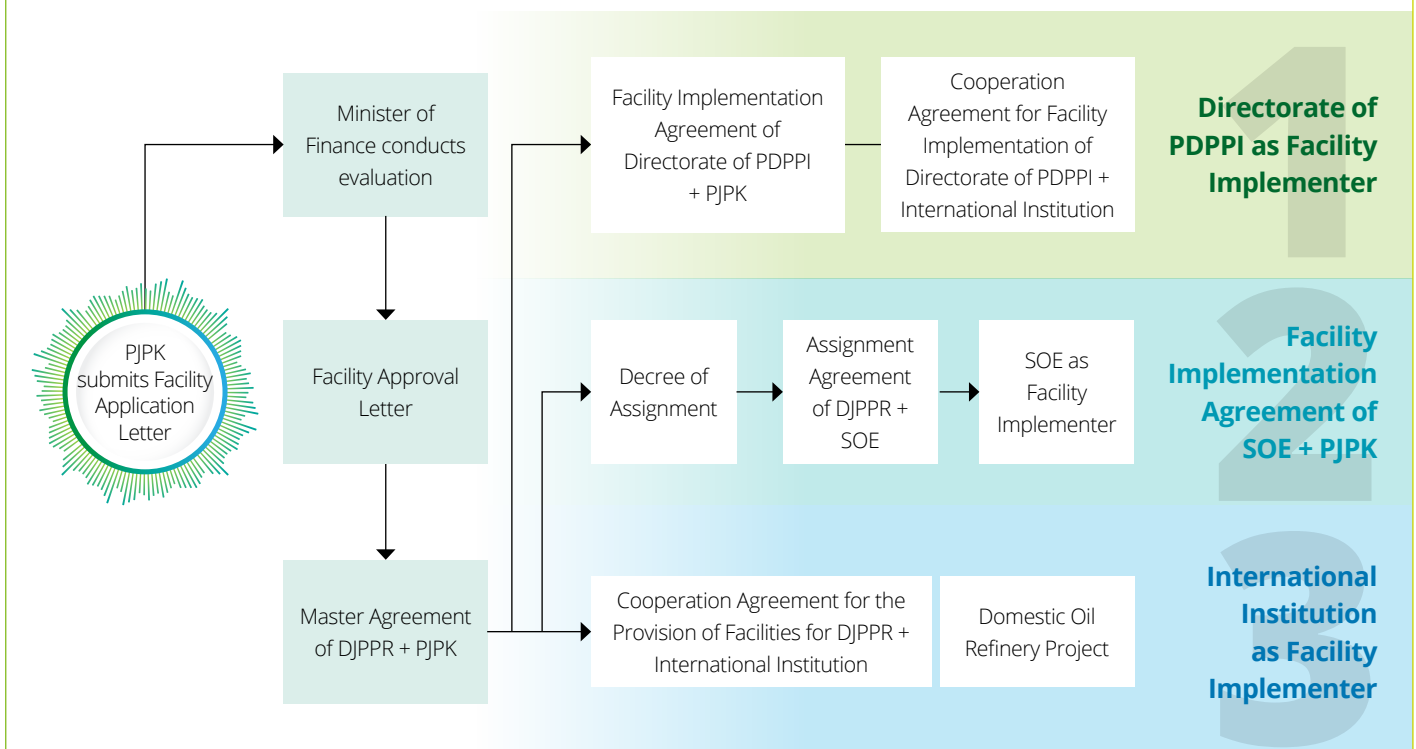
Another challenge is also the lack of well-prepared, bankable PPP projects. Private investors require assurance on commercial and technical feasibility, risk allocation, public sector commitment, and the institutional and legal framework of projects. To tackle these challenges, governments should consider benchmarking their PPP policies against global best practices, standardising their PPP approaches, as well as streamlining gateway and approval processes.

### An overview of PPP project preparation facility

To facilitate PPP implementation in Indonesia, the Ministry of Finance has established the Directorate of the Implementation of Government Support and Infrastructure Financing (PDPPI) under the Directorate General of Financing and Risk Management.

As stipulated by Regulation of the Minister of Finance Number 180/PMK.08/2020 of 2020 regarding Facilities for the Preparation and Implementation of Project Transactions between the Government and Business Entities in the Provision of Infrastructure, the PDPPI, together with the Ministry of Finance, will be responsible for supporting the head of the local government or project person-in-charge (PJPK) in planning for feasibility studies, preparing tender documents, and executing project transactions during the project preparation phase (see Figure 3).

**Figure 3: Illustrative example of process flow in the PPP project preparation facility**





### Blended finance mechanisms

While there are a number of differing definitions and interpretations, blended finance mechanisms by and large refer to the strategic use of development finance obtained from a variety of capital sources, such as public, commercial, or philanthropic entities, for the mobilisation of funding towards sustainable development.

Designed to unlock funding for projects that would not be achieved on commercial terms, blended finance mechanisms are emerging as an attractive proposition for developing smart cities because these instruments enable the participation of investors with different risk profiles and investment horizons. In doing so, they broaden the potential investor base for any given project.

Unlike PPPs, blended finance mechanisms are also not limited to infrastructure projects and can be applied to projects in all sectors. They must, however, contribute towards sustainable development: the success of blended finance mechanisms is typically measured by their performance on the 17 UN SDGs.<sup>23</sup>

Despite their potential, blended finance mechanisms are also often intertwined with risks stemming from political instability, demand fluctuations, and other country-specific challenges that could impact a project's bankability and attractiveness. In addition, the lack of an accessible intermediation platform for sustainability projects also makes it difficult for private financiers to participate in blended financing. As with PPPs, further challenges also arise from the lack of strong institutional frameworks and de-risking mechanisms.

### Financing the development of Nusantara New Capital City (IKN)

On 18 January 2022, Indonesia's parliament passed a landmark bill approving the relocation of its capital from Jakarta to Nusantara in East Kalimantan. At this point of writing, construction of IKN Nusantara remains underway, with completion expected in 2024.

As a city built from the ground up, IKN Nusantara will adopt 5G-enabled smart city concepts from the very outset. In doing so, the new capital city aims to blend Kalimantan's signature green and natural environment with advanced digital technology for a more digitally advanced and sustainable way of doing business.

Investments in the development of the new city are expected to cost around IDR466 trillion until 2045. The government will cover 20% of this cost through its national budget or Anggaran Pendapatan dan Belanja Negara (APBN), with the remaining 80% expected to come from private investors.<sup>24</sup> As of July 2024, the IKN Authority has received around 421 letters of intent from private investors, with the majority of foreign investors hailing from China, Japan, Malaysia, Singapore, and South Korea.<sup>25</sup>

To encourage greater uptake of PPPs, the government has also introduced a number of tax facilities to incentivise investment and business activities in IKN Nusantara, including but not limited to lower corporate income tax (CIT) rates; tax deductions for certain activities or expenditures; final income tax rate of 0% on certain gross income for small and medium enterprises; and income tax exemptions for the transfer of rights over land and/or buildings. Various value-added tax (VAT) and local services tax (LST) facilities will also be made available to IKN Nusantara and its surrounding regions until 2035.

Other schemes available to IKN Nusantara investors also include the AP scheme with payment guarantees backed by the Ministry of Finance, as well as user payments, build-operate-transfer, joint ventures, utilisation cooperation, and alternative financing schemes such as crowdfunding, philanthropy funds, and carbon trading.<sup>26</sup>

### Smart city financing risks and mitigation

In any infrastructure project, all of the project's stakeholders, including the construction company, the operator, the public sector, the lenders, the investors, and the sponsors from the public and private sectors, must identify potential risks and create plans to reduce them. While PPP and blended finance each has different risks, there are some main risk headings connected to smart city financing that financiers, sponsors, or lenders worth taking into consideration.





23 "Blended finance focus areas". Organisation for Economic Co-operation and Development (OECD).

24 "KSP: Pembangunan Ibukota baru perlu anggaran Rp 466 T, tak semua ditanggung APBN". Kompas.com. 29 June 2021.

25 "OIKN Ungkap Surat Minat Investasi IKN Capai 421 hingga Juli 2024". Bisnis.com. 12 July 2024.

26 "Skema KPBU, Apa Perannya dalam Mendukung Pembangunan IKN?". Government Cooperation with Business Entities - Ministry of Finance of RI.



Type of Risk		Details
Construction risk		Encompasses anything that may result in cost overruns, delayed completion, or non-completion. The degree of risk may vary depending on the complexity of the construction or design, the contractor's experience, and the robustness of the supply chain.
Sponsor risk		Lenders need to assess the levels of capital provided, the ability of the sponsors to access additional capital, the ability of sponsors to deliver the project on time and on budget, and the ability of sponsors in resolving problems that may rise.
Operating risk		Lenders will need to hire qualified operators with excellent budget management and trained personnel because operation of the project and provision of the service often affect payments to the sponsor.
Technology risk		Technology used in the project that performs badly will affect the project's revenue. To mitigate this, sponsors and lenders need tested technologies to know if the risk of problems connected with obsolescence, replacement costs, and future operating costs becomes more significant.
Environmental and planning risk		Risk related to environmental liabilities. To mitigate this, lenders will want to confirm that project sponsors have obtained all the necessary consents and approvals related to planning and the environment, as well as analyse the risk of changes in environmental regulation could affect the project.
Legal risk		Refers to the risk where laws are premature, uncertain, or subject to change. To mitigate this, lenders will need to seek legal opinions to ensure legal, valid, binding, and enforceable under the relevant laws. The risks of change of law are generally retained by the government.
Force majeure risk		Risk that is beyond the control of any parties of the project, such as natural disasters. To mitigate this, a force majeure clause in the project's contract can be used to excuse any party's performance on such occasion.

There are other ways to mitigate risks in smart city financing. The action taken will vary, depending on who is incurring the risk and what kind of risk it is. For instance, lenders may manage their portfolios by setting rules and regulations that control the amount of risk exposure they will accept in each investment to manage their risk exposure. Lenders may also request insurance should hazards like force majeure or political crisis affect the project, or assurance – in the form of guarantees from the sponsor or procuring agency – should there be changes in the laws or regulations. Stakeholders may also consider debt covenants, step-in rights/events of default, reserve accounts, performance bonding, scenario and sensitivity analysis, liquidated damages, and entering hedging contracts – such as swaps – as ways to mitigate risks in smart city financing.





# Embarking on a New Era of Urban Development

The rapid pace of urbanisation is placing enormous pressure on cities in Indonesia to rethink the way they provide even the most basic services, and re-examine the way they connect with residents, businesses, and other ecosystem participants in new ways that go beyond simply expanding physical infrastructure.

As they embark on this new era of urban development, we propose that they take into consideration the following five factors:

## 1. Vision

Before embarking on any significant smart city initiative, cities should determine what being a smart city actually means to them and how they should measure progress toward their goals. This vision should be ambitious but specific, with clear criteria and timeframes for success.

## 2. Ecosystem

Governments and public sector stakeholders play critical roles in making cities smarter, but they cannot do it alone. The smart city of the future must convene financing and problem-solving capabilities beyond traditional boundaries. This requires an ecosystem of partners across government, businesses, start-ups, the academic sector, and the nonprofit world.

To this end, early engagement is critical for success. Ecosystem players must engage one another early in the process of the development of any smart city initiative to not only build trust and buy-in, but also determine economic viability and technical feasibility, resolve conflicting goals surrounding value and return on investment, and achieve alignment between the initiative and the local government's overarching city plan or strategic plans with other public sector agencies.

## 3. Governance

In their effort to unite a diverse ecosystem of stakeholders, smart cities require clearly defined governance. City leaders, regional governments, transportation districts, corporate and nonprofit partners and, depending on the funding model, national agencies

may all participate in establishing and executing a smart city vision. To make it work, stakeholders must have clarity on their roles and responsibilities, and a stake in the outcome. There should also be processes in place to establish accountability upfront, and ensure that the appropriate information flows to the right decision-makers.

## 4. Technology underpinnings

While the precise technology underpinnings for each smart city will differ according to its unique needs, all smart cities require at the minimum an integrated, fit-for-purpose technological foundation, including system architecture, data governance, interoperability, and cybersecurity (see sidebar for a holistic approach to managing data and cybersecurity risks).

In this regard, two additional considerations are worth noting. Firstly, in designing and implementing the technological foundation and overarching data strategy, it is important to ensure that the systems are interoperable and capable of evolving with time; secondly, there also needs to be adequate socialisation of technology-based solutions. This is especially the case for certain segments of the population, where digital inclusion and digital literacy rates may be lagging.

## 5. Funding

Finally, to realise the full potential of novel smart city concepts, novel financing approaches will be required. Traditional funding sources such as tax revenue can be supplemented by private sector financing through innovative financing solutions, such as PPPs and blended financing mechanisms.



**Figure 4: Smart city funding considerations**

Step	Consideration	Key questions	Impact on private involvement
Determine public authority. (What do I have permission to do?)	<b>Laws and statutes</b>	What laws and policies exist regarding private financing and delivery of infrastructure?	A poor legislative and statutory environment can make it difficult to gain private sector participation in infrastructure development.
	<b>Political</b>	Are there political constraints that would make it difficult to use certain partnership structures?	Many jurisdictions are limited in the type and level of responsibility they can allocate to a private partner.
Define project needs and objectives. (What do I want to do?)	<b>Speed</b>	How quickly does the asset need to be delivered?	Traditionally procured projects typically begin sooner and have shorter procurement cycles, while PPPs are more likely to be completed on time.
	<b>Efficiency</b>	How can the asset be delivered and maintained as efficiently as possible?	properly structured partnerships focus the contractor's attention on delivering the lowest overall life cycle cost.
	<b>Innovation</b>	Is there an opportunity to incorporate private sector innovation?	The greater the scope for flexibility in the nature of the technical solution/service or the scope of the project, the more opportunity for private sector innovation.
	<b>Degree of certainty</b>	Will changes in technology, policy or demand affect how we would meet the need tomorrow?	The greater the uncertainty about the project's scope and scale, the more likely that a hybrid PPP or traditional procurement is the best option.
Determine the best "owner" for each project component. (Who can and should do what?)	<b>Financial</b>	Who is going to pay for the project?	Fiscal condition can either widen or constrain the Private Sector Participation (PSP) options available.
	<b>Capabilites</b>	What capabilities are the in-house to deliver and/or manage the project? What capabilities exist in the market?	If a PSP model is chosen, the public sector must create the institutional capacity to manage a complex set of contractual arrangements
	<b>Risk</b>	How much risk should be transferred? Who is best able to bear what risks?	Optimal risk allocation is critical to successful partnerships.

Source: Deloitte, "Private sector participation in public sector financing: An introduction", May 2018.



### **A holistic approach to managing data and cybersecurity risks in smart cities**

Smart cities are powered by data that is aggregated and managed across extensive networks of sensors, cameras, connected devices, and personal databases. This complex network of interconnected devices and data exchanges exponentially increases the risk of cyberattacks, as malicious actors can exploit vulnerabilities at any point in the vast network to access sensitive data.

To safeguard data and mitigate cybersecurity risks, a holistic approach involving all stakeholders in the broader ecosystem is therefore necessary. Broadly, such an approach entails:

#### **Syncing smart city and cyber strategies**

In order to address the challenges posed by the ongoing convergence, interoperability, and interconnectedness of their urban systems and processes, cities should develop comprehensive cybersecurity strategies that align with their broader smart city initiatives. As a first step, they should conduct a thorough impact assessment of their data, systems, and cyber assets to identify and mitigate risks associated with their technological processes and policies.

#### **Formalising cyber and data governance**

Effective cyber and data governance in smart cities requires comprehensive data management policies covering data sharing, data privacy, data analytics, and data monetisation aspects. In a smart city ecosystem with multiple diverse players, this also implies the need for a clearer definition of roles and responsibilities across all critical components of the ecosystem. To facilitate the sharing of information and best practices, smart cities should also consider establishing collaborative networks with other cities, government agencies, academic institutions, and private sector partners to strengthen their cyber defences.

#### **Building strategic partnerships to grow cyber capabilities**

To augment existing cyber capabilities and expand the range of their expertise, cities should consider building strategic partnerships with service providers across various fields to leverage their know-how and expertise. At the same time, they should also consider investing in efforts to address the persistent cyber skills gaps through upskilling and other non-conventional methods, such as hackathons and crowdsourcing.

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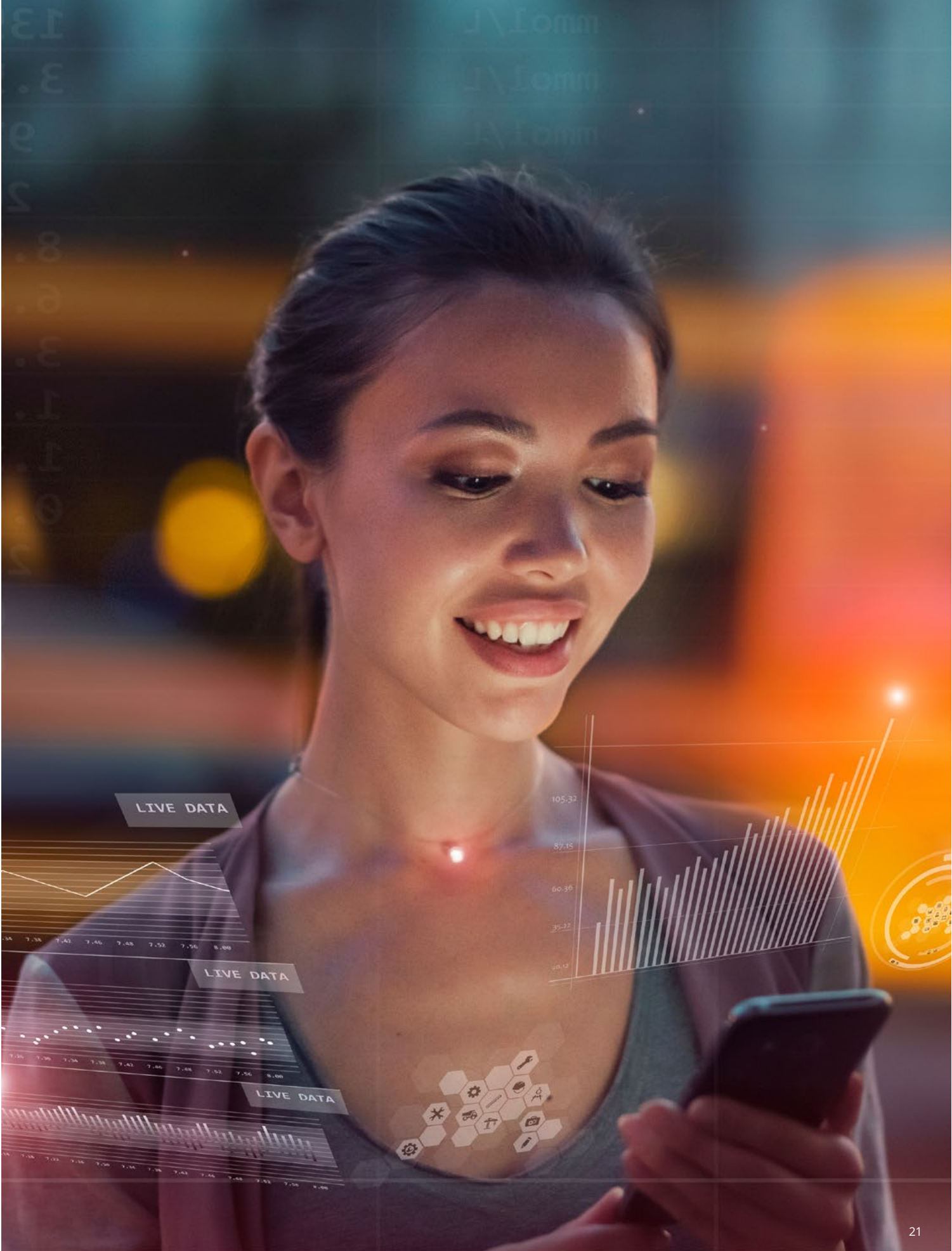
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