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Primer for Smart City Public-Private Collaborations



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How to use this document

The document is intended as a primer for public-private collaborations involving smart city projects. “Smart city” is a broad term used to encompass multiple facets of urban development, but in this document, we focus on the use of technology and data management to meet urban challenges in public spaces to help address social, economic and environmental issues. **Public-private collaborations** (PPCs) refer to contractual and non-contractual arrangements between a public agency and a private sector entity, which could include profit and non-profit sector entities, as well as academics, philanthropy, community leaders and others.

This document uses the term “collaborations” instead of “partnerships” to include all types of public-private

agreements, irrespective of the duration of the projects, the level of formality, and the procurement process. These collaborations include a diverse set of stakeholders and encompass physical infrastructure and other less traditional sectors. Although there are many varying definitions of what public-private partnerships (PPPs) consist of, they are commonly associated with long-term physical infrastructure contracts involving large corporations.

This document is particularly attentive to PPCs that drive digital transformation in infrastructure to deliver greater efficiency, experience, safety, sustainability and resilience.

1 What is a public-private collaboration and why is it used?



Public-private collaborations (PPCs) refer to contractual and non-contractual arrangements between a public agency and a private sector entity (business and/or non-profit sector entities). Through these arrangements, the financial and non-financial assets of multiple sectors are shared in a joint initiative to address financial, technical, information, social and environmental challenges. Assets usually refer to physical infrastructure. In smart city projects, data is also considered an asset because it is a significant component of the operation of the projects. PPCs most often consider the design, finance, build, operation and maintenance functions of a project, and they have an outcome-based, performance agreement structure. A service or facility is often the output of a public-private collaboration intended to serve the general public.

Public-private collaborations reflect a form of indirect management in public administration, where collaboration with business and non-profit sector partners is deemed valuable. It implies that public, private or non-profit partners make decisions jointly and share the risks associated with them.

There is also a spectrum of formal to informal governance, legal, technical and financial considerations in public-private collaborations.

Differences with other types of procurement include the following:

PPC vs traditional procurement: In traditional procurement, the public entity arranges financing for the project and awards delivery of the project to the private sector for a fee. Delivery can include design and construction and/or operation and maintenance. The public sector assumes responsibility for some elements of risk and tends to have some control over social impacts.

PPC vs outsourcing: Outsourcing is a form of traditional procurement where the government pays the private sector, charities or other organizations to deliver goods or services directly to the end user. These contracts are typically long-term, where some degree of asset ownership is transferred from government responsibility to vendor responsibility, and vendor responsibility is defined by an ongoing service-level agreement.¹

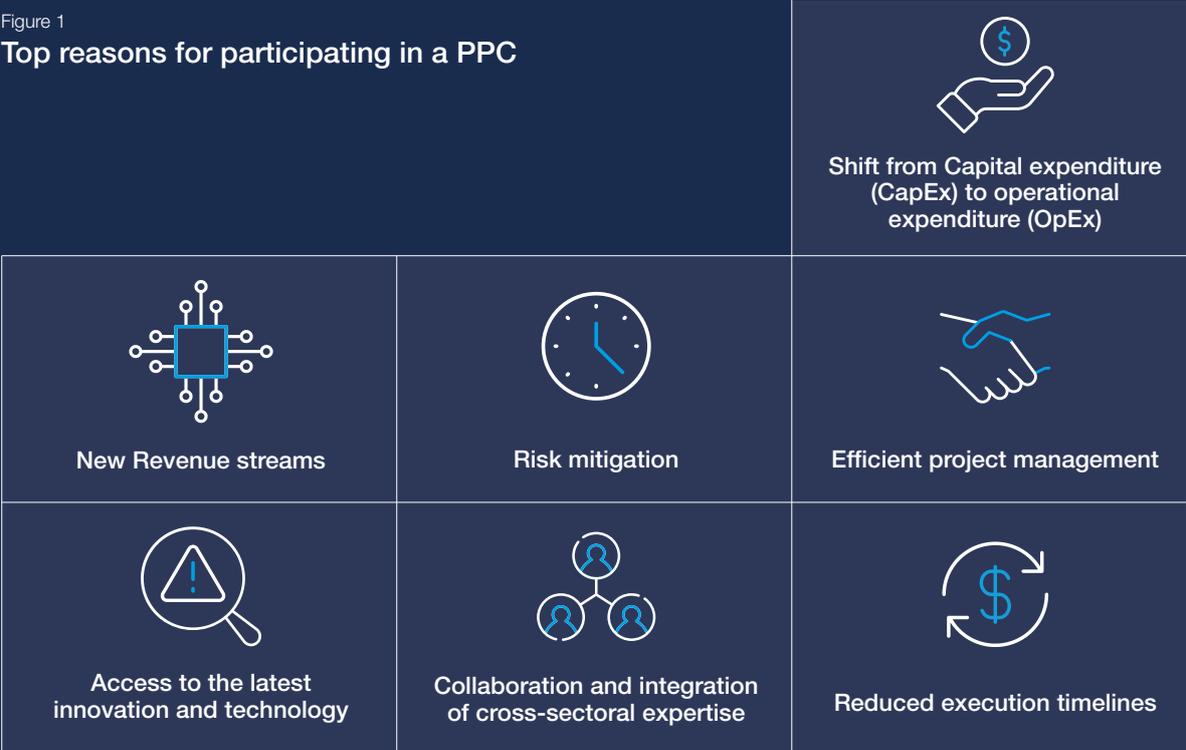
PPC vs philanthropy/corporate social responsibility: These are examples of when discretion is private and private actors satisfy public interest objectives. In these cases, no matter how much one seeks to create public value, the private sector ultimately holds decision-making authority.

Motivation for engaging in PPCs

PPCs can offer significant advantages to cities. A public entity usually enters into a collaboration agreement because it needs resources and expertise that the private and non-profit sectors can provide.

The top reasons for participating in a PPC are presented in Figure 1 and discussed in detail separately.

Figure 1
Top reasons for participating in a PPC



Source: World Economic Forum

- **Shift from capital expenditure (CapEx) to operational expenditure (OpEx):** Cities often lack the budget to complete the desired project, especially the CapEx required. PPCs allow the financial model to shift to an OpEx model, thereby reducing the cost of entry.
- **New revenue streams:** PPCs can employ the private sector’s expertise in creating new revenue streams. Traditionally, this has included usage fees such as tolls and penalty fees, but with smart city services, revenue can be obtained from data monetization, operational efficiencies such as energy savings, connectivity services, digital signage, kiosks and more enforcement opportunities.
- **Risk mitigation:** Cities want to mitigate risks given the infancy of the smart city sector. Public-private collaborations offer the possibility of sharing and

transferring risks within the partners. Examples of risks that arise in smart city PPCs are:

- Adoption risk: Will customers/citizens adopt the service at a rate that supports the business model?
- Financial risk: Will the key assumptions in the business model hold across the term of the PPC (e.g. cost of capital and subscription rates)?
- Solution risk: Will technology-centric projects deliver the promised outcomes/service quality?
- Risk of scale: Can the technology successfully grow from a pilot to citywide implementation?
- Risk of exponential change: How to deal with technology constantly shifting?

- **Efficient project management:** City authorities often lack the time and personnel with the capabilities and skills required to engage in projects that incorporate innovative technology and manage them over a concession period.
- **Access to the latest innovation and technology:** Cities need access to the latest innovation and technology from the private sector. Collaboration models can offer a more flexible co-design approach than more traditional procurement methods.
- **Collaboration and integration of cross-sectoral expertise:** PPCs allow for collaboration and

integration of expertise across multiple sectors (e.g. transport, financial services, technology). This kind of cross-sector collaboration to drive new services or for service innovation can be very difficult when executed by city authorities alone.

- **Reduced execution timelines:** The private sector is more agile and moves at a faster pace, increasing the speed of completing initiatives.

By diversifying funding sources, distributing risk and reward effectively, and bringing expertise from all sectors, PPCs allow governments to efficiently expand and improve their services, generating buy-in from all stakeholders.

2 Opportunities for PPCs in a smart city context

Community leaders face an increasingly complex set of challenges, ranging from climate change to social inequalities, population shifts and financial pressures. Effective solutions to these challenges are outcomes-oriented, and leaders acknowledge the need for a more resilient, sustainable and responsive city.

Emerging technologies can enable a more dynamic city, using new tools for data creation and

management to meet public goals. While the public-private partnership structure has traditionally been used across the development cycle of physical infrastructure assets or the management of core city services and operations, technology and urban innovation can support a new public-private collaboration approach, both to retrofit existing agreements and capture emerging opportunities from the use of city assets or new business models.

Figure 2

Brief snapshot of opportunities for PPCs in a smart city context



Source: World Economic Forum

Emerging technologies can impact how existing infrastructure is maintained and operated, and consequently the economics of these existing agreements. For example:

- Internet of things (IoT) sensors allow preventative maintenance.
- New mobility services can reduce road tolls.
- Performance data can offer more transparency into compliance and/or accountability in contract terms.



Public-private collaboration to reinvent infrastructure assets

Driving innovation in Chicago Millennium Parking Garages, Illinois, United States

Context: Millennium Garages is one of the most extensive downtown public underground parking systems in the United States, consisting of four facilities: Grant Park North, Grant Park South, Millennium Lakeside Garage and Millennium Park Garage. As Chicago is one of the top five most congested cities in the United States, innovative technological solutions that might use parking facilities like Millennium Garages to solve today's critical urban issues (congestion and electric vehicle (EV) charging infrastructure) were needed.

The project: The initiative rethinks the role of important urban assets, such as parking garages, in achieving better economic, environmental and social results. The partnership aims to better integrate parking into the larger mobility landscape, which includes public transport, ride and vehicle-sharing, electrification, and automation, as well as explore innovative facility management, freight and logistics hub opportunities, and other creative uses for cities.

The collaboration and outcomes: The partnership consists of a 100-year City of Chicago management concession, with over 80 years remaining still. It's been operated by SP Plus, a mobility services company, and strategic investors include global infrastructure investment and pension funds with a long-term stake in the future of urban mobility. The project enables an extensive network of corporate, start-up, municipal and civic partners working together. The capital improvement plan spans physical infrastructure, digital connectivity, energy infrastructure, expanded access points and accessibility.

Defining the value of a public asset over time is a big challenge, whether to estimate the possible risks or accurately assess the present value. As technology changes fast, the use of an asset could also change, and so does its value, for example, if cars are replaced for another form of transport. The value an asset has today has to include the revenues that will be generated in the future. The Chicago Millennium Parking Garages is an ongoing project looking at how a physical asset holds an opportunity to evolve through technology and cross-sector collaboration.

Opportunities for the use of city assets in PPCs

Public-private collaborations can repurpose city assets for the deployment of digital infrastructure and the creation of data services. These can include:

Physical assets, such as rooftops, utility poles, streetlights, traffic lights, ducts and more, can become smart assets and be used to drive efficiencies and new services.

Public spaces and airspace can take on new value as technology, such as drones, enabling new use cases.

Digital infrastructure assets that can generate numerous sources of data, leading to valuable data on mobility, crime, advertising, energy use and air quality.



Public-private collaboration for an intelligent lighting system

City of San Diego, California, United States

Context: The City of San Diego in the early 2000s was looking for a way to be more efficient, reduce energy usage and save money.²

The project: The city's old sodium vapour streetlamps were replaced with LED lights, using 60% less energy and reducing maintenance due to longer life spans. Overall, more than 35,000 lights were replaced by General Electric (GE), reducing approximately \$2.2 million annually in energy use and maintenance costs.

It was acknowledged that additional benefits could be included through this expanded connectivity. The first step was to connect the city's lighting infrastructure through LightGrid – a wireless system and adaptive control program to control and monitor streetlights remotely. The following step was that the City of San Diego agreed to pilot GE's system called "Intelligent Environments for Cities", enabling the connectivity of machines – adding nodes holding sensors in LED streetlamps – to a network that links devices and processes metadata collected into the cloud.

The collaboration and outcomes: These LED fixtures acting as data-gathering machines were the basis of San Diego's vision to build a municipal IoT network offering a host of potential applications. The first trial of this kind of system and its benefits started with parking. In 2014, the city ran a pilot using intelligent sensor nodes that monitor traffic to enable people to find public parking spaces and improve safety. Subsequently, San Diego's smart street light program was publicly announced in partnership with GE Current.

This initiative was part of a regional vision to go green through the use of new technology in lighting. In order to involve the community, a hackathon was held to gather interested members to work on how to make more applications including all the new information.

Current status: In September 2020, the City of San Diego had to deactivate all sensor services, including cameras on its smart streetlights until a new ordinance. The program had received criticism over privacy concerns, which culminated when video footage from a streetlight was used by the city's police department to assist in solving crimes. The main request was about proposing clear rules for the use of this technology to solve criminal cases.



Public-private collaboration to repurpose public assets and city spaces in new innovative ways

New York City, New York, United States

The project: LinkNYC is a public-private collaboration in New York City that aims to replace the city's antiquated network of payphones with smart kiosks that enable high-speed Wi-Fi, phone calls and other city services at no upfront cost to the public or taxpayers. It is financed through advertising on digital displays at the kiosks and other auxiliary services, with a revenue-sharing agreement between the city and the private sector partnership that was selected to develop LinkNYC.

Context: In 2013, the City of New York launched the Reinvent Payphones Challenge to spur the development of physical and virtual prototypes that reimagine the future of the city's more than 10,000 ageing public pay telephones. The public challenge engaged hundreds of urban designers, planners, technologists and policy experts, and many proposals were received.

The collaboration and outcomes: Building on this public challenge, the city issued a request for proposals in 2014 for a citywide franchise to install, operate and maintain new public communications structures, replacing the existing payphones with new digital infrastructure and other public services. The request for proposals put forward a set of requirements for the new structures while providing significant flexibility for the private sector to propose new public services to enhance urban life.

A consortium of companies, known as CityBridge, was awarded a non-exclusive 12-year franchise agreement to design, install, operate, repair, maintain, upgrade, remove and replace public communications structures. In 2015, CityBridge started replacing the city's obsolete payphones with smart kiosks (called "links") that provide free Wi-Fi, maps, transport updates, video calls, device charging and more. CityBridge finances and operates the entire LinkNYC system and offers the services to users free of charge, funded with advertising revenues and other auxiliary services.

Opportunities for new PPC business models

Smart city services can generate new revenue streams and revenue savings to be shared between partners.

Revenue savings

- **Lighting:** Significant savings from halogen to LED conversion and additional savings if smart nodes are adopted to optimize maintenance schedules and dimming efficiency.
- **Waste management:** Generate savings by only picking up full waste bins as well as through smart route management. There are also potential gains through improving the quality of recycling by using AI to sort out waste to be recycled.
- **Solar power:** Cities can generate significant savings through solar energy, although these savings generally take longer to materialize than in the use cases mentioned above.
- **Automated or real-time inputs:** Reduces the manual labour required to service and maintain city services (e.g. parking, cleaning, gardening).



Public-private collaboration to promote data management systems

Connected control station (PPC) in Dijon Metropole, France³

Context: The project was conceptualized to increase economic development and attract new participants from the innovation sector by connecting the 23 municipalities' urban equipment and centralizing their control on a single centre.

The project: France's city of Dijon is becoming an intelligent metropolis by developing a remote management control system. The connected control station (PPC) gathers digital data from all urban equipment (traffic lights, street lighting, video safety, etc.) of the 23 municipalities of the territory.⁴ The 12-year public-private partnership was developed between the Dijon Metropole and a consortium of four private sector actors (Bouygues, Capgemini, EDF and Suez).

The collaboration and outcomes: This collaboration allows partners to capture the return on investment (ROI), measured carefully with performance metrics, and gives them the opportunity for future smart infrastructure investments, capturing new revenue generated from the deployment of new solutions. At the same time, the city benefits from reinvesting the cost savings. Smart streetlights are a key asset that provides operational cost savings, and the city can reinvest those savings into other smart infrastructure. In the beginning, it was intended to achieve energy savings by reducing energy usage in lighting. Then it proposed to reinforce people's safety and well-being by promptly handling everyday and extraordinary incidents.

As a result, the OnDijon connected control station enables the urban equipment to be remotely controllable and facilitates the coordination of public services interventions and improvements. The next phase of this project is to integrate additional data sets into the control centre, allowing interoperability.

Revenue generation

- **Digital signage and smart kiosks:** Smart kiosks can serve as IoT hubs in central areas and can provide many positive benefits to cities ranging from video safety to an interactive citizen portal. In addition to providing value to both cities and citizens, kiosks are a reliable source of revenue for cities through the advertising revenue they generate. Though digital signs are not interactive and lack the city-citizen benefit of a kiosk, they are still a source of revenue.
- **Automated enforcement:** Roadway safety technology, enforcement specific, not only reduces accidents and fatalities but is also a great way to generate additional revenue. Examples include automated ticketing for speeding, red-light violations, helmet violations and illegal school bus passing, among others. However, revenue generation could only increase in the short term, as violations to law enforcement are expected to decrease over time due to the efficiency of ticketing and collecting.
- **Data monetization:** Mobility data can have value to many businesses, for example, to the property and real estate sector due to its impact on land and property values.
- **Smart parking:** Technology-based parking solutions can increase revenue through automated payments and enforcement, reducing non-paying customers to zero and through analytically based dynamic pricing, i.e. charge more during events and peak times and charge less during off times.



Public-private collaboration for the modernization of public transport

Public transport dispatching system and electronic ticketing in Almaty, Kazakhstan⁵

Context: As is the case in many cities across Kazakhstan, urban transport in the city of Almaty has suffered from severe under-investment over the past twenty years, coupled with a privatization process of the urban bus sector devoid of any subsequent regulation. The lack of contractual controls and incentives for operators to provide better services has allowed the private bus services to become characterized by non-adherence to timetables, chaotic over-supply of buses on main routes concentrated in peak hours and poorly maintained units that pose an increasing health and safety issue.

The project: The city of Almaty sought to improve the quality of urban public transport through the introduction of automatic bus dispatching and an electronic ticketing system, which would also improve the transparency and legalization of collections from public transit. GPS dispatching was provided for over 2,000 buses and trolleys with an electronic fare payment system (Onay card).

The collaboration and outcomes: The investment partner provided 100% of the investment and operational costs, and the city government provided regulatory support. The mayor's office introduced a differentiated tariff to promote the use of the electronic fare system, whereas cash payment was set two times higher than non-cash payment. The government provides a fixed payment to the partners for operating costs, and partners collect revenues on ticketing.

The contract is in place from 2018 to 2023 and success is measured by pre-defined KPIs. These KPIs include the percentage of on-time and consistent bus routing and scheduling, the proportion of electronic payments, etc. If KPIs are not achieved, penalties are applied. As a result, adherence to the bus schedule has improved to 90% on time, on schedule, and the volume of bus fleet revenues has more than doubled.

3 Key issues for smart city PPCs



Public-private collaborations and partnerships have well-known obstacles and barriers, including governance, risk-sharing, political commitment,

technical skills and regulations. For smart city PPCs, specific barriers and issues arise beyond those found in more traditional projects.

Figure 3

Key issues for smart city PPCs

 Data management and governance Risks associated with storing and managing data		
 Data privacy and public engagement Politicisation of the data privacy debate	 Interdependence and the need for cross-silo collaboration Risks associated with high level of interconnectedness and involvement of multiple organisations and systems	 Data as an asset Missing collaboration around data to draw insights and create actionable intelligence
 Funding and financing instruments Technical expertise to structure the project financials as these skills are scarce when technology is new	 Risk management Higher probability of risks when technology and services are new	 Equality of opportunities A risk of some communities not having access to the services being offered

Source: World Economic Forum

Data management and governance

Issue: Data is an essential component of smart city projects because the use of technology generates copious amounts of it. However, there are many risks associated with storing and managing data collected through public-private collaboration projects. A key challenge is how and to what extent the data held by the private sector can be accessible to the public sector. This would be particularly important in addressing societal challenges, such as pandemics and climate change, as data collected by private entities in sectors, including transport and energy, would be valuable for public purposes.

Considerations: Irrespective of who deals with data throughout a public-private collaboration, governments should make sure that data is being managed appropriately, which requires the right policies and regulations to ensure compliance with a city's data strategy.⁶

Regulation needs to be in place, but the question arises as to how to regulate whilst also incentivizing innovation. [Agile regulation](#) helps to build an understanding of where regulation is needed, as well as the impact of a technology use case and unforeseen risks that it may generate. It requires that cities, the private sector and institutions work together on developing and updating these policies and regulations. Lessons from this process can then be shared globally.

In addition, city governments need to have adequate skillsets amongst their workforce to establish the appropriate governance structure and tools. Cities need people with a baseline level of expertise in technology and data management – even when partnering with companies that have that expertise – because they need to be able to understand what their partners bring to the table. They will also be faced with the need to manage some technology deployment and data creation.

The [G20 Global Smart Cities Alliance policy roadmap](#) includes model policies for open data, privacy and cybersecurity, and is continuing to develop model policies for additional topics that need to be considered with respect to data. Due to the infancy of the smart city sector, these model policies will need to be revisited over time, but they provide an important foundation for governments to prepare a data strategy that should include a risk management approach.

Data privacy and public engagement

Issue: The processing and management of data are the most challenging tasks in the development of smart cities. This refers to data existing in municipal databases, as well as data connecting with new technologies and sensors in the smart city, which has an influence on security and privacy.

Considerations: Data privacy is a fundamental principle that all smart city programmes should hold,

and sound data management and data governance is required to achieve this, as outlined above. In addition, the politicization of the data privacy debate necessitates a considered public engagement strategy. Public trust can also be encouraged by including communities in the design of smart city projects, services and governance. This co-creation makes a clear connection between the proposed PPC and the citizen-centric outcomes that it is intended to create.

For its flagship [Quayside project](#), Sidewalk Labs took measures to promote its privacy protections and commitments, including a proposal to create an Urban Data Trust, which would be responsible for data governance in the smart district. These measures were intended to ease concerns over control of personal data and the public domain by “big tech”. However, it was not sufficient to overcome the public's underlying lack of trust in the project, which was further undermined when its main privacy advocate resigned. Responsibility for data governance then shifted to government, which had not been foreseen at the project's inception. Since the project's closure, the City of Toronto has proactively engaged with communities and privacy advocates to formulate its [Digital Infrastructure Strategic Framework](#).

Interdependence and the need for cross-functional governance and collaboration

Issue: Smart city applications typically span multiple organizations and systems. In many cities, this can mean working with a variety of asset owners and service providers, which can pose a significant governance challenge.

Moreover, smart city systems are inherently more interconnected than their precursors. For example, smart lighting sensors might detect traffic flows and feed this data to an intelligent transport system that regulates traffic lights. As cities become more integrated, they become smarter, however, there are risks associated with this level of interconnectedness. If something goes wrong in one system, the

interconnectedness means that one error could cascade to become a much larger issue.

Considerations: Collaboration is required to align incentives and share the benefits between all the stakeholders needed to deliver the project successfully. To manage risk, it is useful to understand what could happen if risks are not managed properly, so learning from past and existing experiences is important, especially because technology is constantly changing and evolving. It is also recommended to test innovative technology before implementing it to avoid potential errors, even more so in the absence of appropriate regulation.

Smart lighting projects demonstrate the need for collaboration across multiple asset owners and service providers. Cities often do not own their lighting infrastructure – utilities typically own over 70% of city lights – which can reduce the incentive for a city to undertake a project. This necessitates working closely with the utility provider.

A typical smart lighting project is paid for through cost savings achieved through LED conversion or smart node retrofit. However, city governments are often not in a position to benefit from these cost savings, because they are locked into a fixed payment schedule. Without this key benefit, the city may prioritize other projects with a more immediate ROI. Concurrently, the utility provider may undertake a smart node retrofit without the city's input in order to achieve cost savings, and the city then loses an opportunity to ensure other benefits from smart infrastructure deployment.

Data as an asset

Issue: One of the key challenges could be called the lack of a “culture of data”. Despite the availability of a large amount of very useful data with different agencies, not much of it is used to draw insights and create actionable intelligence for city governance. Collaboration on data is missing among different stakeholders and the power of data as a potential economic resource is not harnessed appropriately. Data governance is an issue that has not been fully addressed by the cities.

Considerations: Data and its value should be incorporated at the outset of a project: at the business case phase. Otherwise, the city will be missing out on the opportunity to generate value. The value of city data is not necessarily how much the data can be sold for, but the potential data has for transforming an organization and making it more efficient, in terms

of the decisions it makes, how it organizes itself, the investment it makes, the services and goods it produces and the impact it generates. Data should be considered an asset and city governments should be aware of the value it has for them and their community. Only then will they be in a better position to take advantage of it.

Despite this, it is usually not straightforward to incorporate into a business case. Calculating the value of data requires its inclusion in accounting standards and business planning. Data is difficult to value, and often requires the pre-existence of a data exchange and book price. Data collected by one entity (place operator) may have a vastly different value to a public entity. Then when data is included as an asset, the question arises as to who is responsible for overall data management.

New Zealand requires city governments to account for their strategic assets. Wellington City Council has included data as one of those strategic assets, integral to the functioning of the city and the delivery of value as an organization. Recognizing data as an asset enables the city to value it, as well as plan for and manage it. The recognition of data as a strategic asset is reflected through their ten-year budget by referring to the data used to make the fiscal decisions on assets, and the investments made in improving the data. This can be seen in programmes such as [New Zealand's Three Waters Reform programme](#), where data is being used to identify improvement projects and condition assessments for investment, showing the benefits of investing in that data. Data is enabling a better targeting of investments in an ageing network.

Funding and financing instruments

Issue: New technology for improving existing services or generating new services directly impacts the financials of the services, requiring rethinking in new ways to finance them so that they can be sustainable in the long-term. For example, electric buses have a different CapEx and OpEx structure compared to diesel buses, so there is a need to incorporate new financing models and incentives to enable the adoption of that technology. Technical expertise is required to structure

the project financials, and those skills are scarce when technology is new.

Considerations: Involving financing actors and experts at the ideation stage may unlock some critical funding and financing strategies and instruments. Co-creation with all relevant stakeholders could generate more buy-in and engagement and has the potential to produce innovative ideas to move the project forward.

Risk management

Issue: Risks are always a significant aspect to consider when structuring a project, and a public-private collaboration project means that risks are to be distributed among partners in a way that is meaningful to all and that minimizes them. When technology and services are new, there is a higher chance of unforeseen risks.

Considerations: To minimize risks, it is important to map them at the business case phase. Involving all

relevant stakeholders from the outset ensures there is co-creation and that the project is technically and financially robust. It is also recommended to test the new services first, which could mean a small-scale and short-term implementation or an implementation in a lower-risk area. When unforeseen risks arise, the negative impact would be smaller than a large-scale implementation. Lessons learned from testing could be incorporated when planning for a large-scale project, and more risks could be mapped and considered from the outset.

Equality of opportunities

Issue: Cities may not always be able to adopt smart city initiatives in a manner that benefits all neighbourhoods equally. There is a risk of some communities not having access to the services being offered, i.e. in the case of connectivity services where economic incentives for service providers vary across areas affecting accessibility.

Considerations: It is important to incorporate the reduction of inequalities as one of the project's objectives so that expectations can be aligned from the outset to meet that goal. It is recommended to have a citizen-centric approach to incorporate citizen benefits in the project's design and to engage the community. Data is key to understanding citizens' needs and expectations and monitoring the project's success.

4 What a successful PPC looks like



Public-private collaborations involve various actors with different interests, knowledge and expertise. They can extend through long durations of time, often transcending changes in government administrations,

political agendas and even technology, all of which add complexities to them. There are key issues that should be taken into consideration for public-private collaborations to be successful, as shown in Figure 4.

Figure 4

Key issues to be taken into consideration for successful public-private collaborations



Source: World Economic Forum

Before a public-private collaboration can be established, there must be a well-defined business case:

This business case must be designed for outcomes. Successful PPCs have a clear and robust business case that defines the PPC's purpose and how it will be funded, its operating model, a governance plan, an implementation plan with clearly outlined risks and benefits for all partners who participate. Most documentation for major infrastructure PPCs will not fit some of the more flexible smart city PPCs, so governments should review their business case templates, which usually inform gateway decisions on major financing. If the government does not consider the value of data or broader social and environmental benefits, the investor/private sector partner is not motivated to deliver on these outcomes and cannot structure ancillary value into their own ROI.

Sustainable and diversified revenue streams:

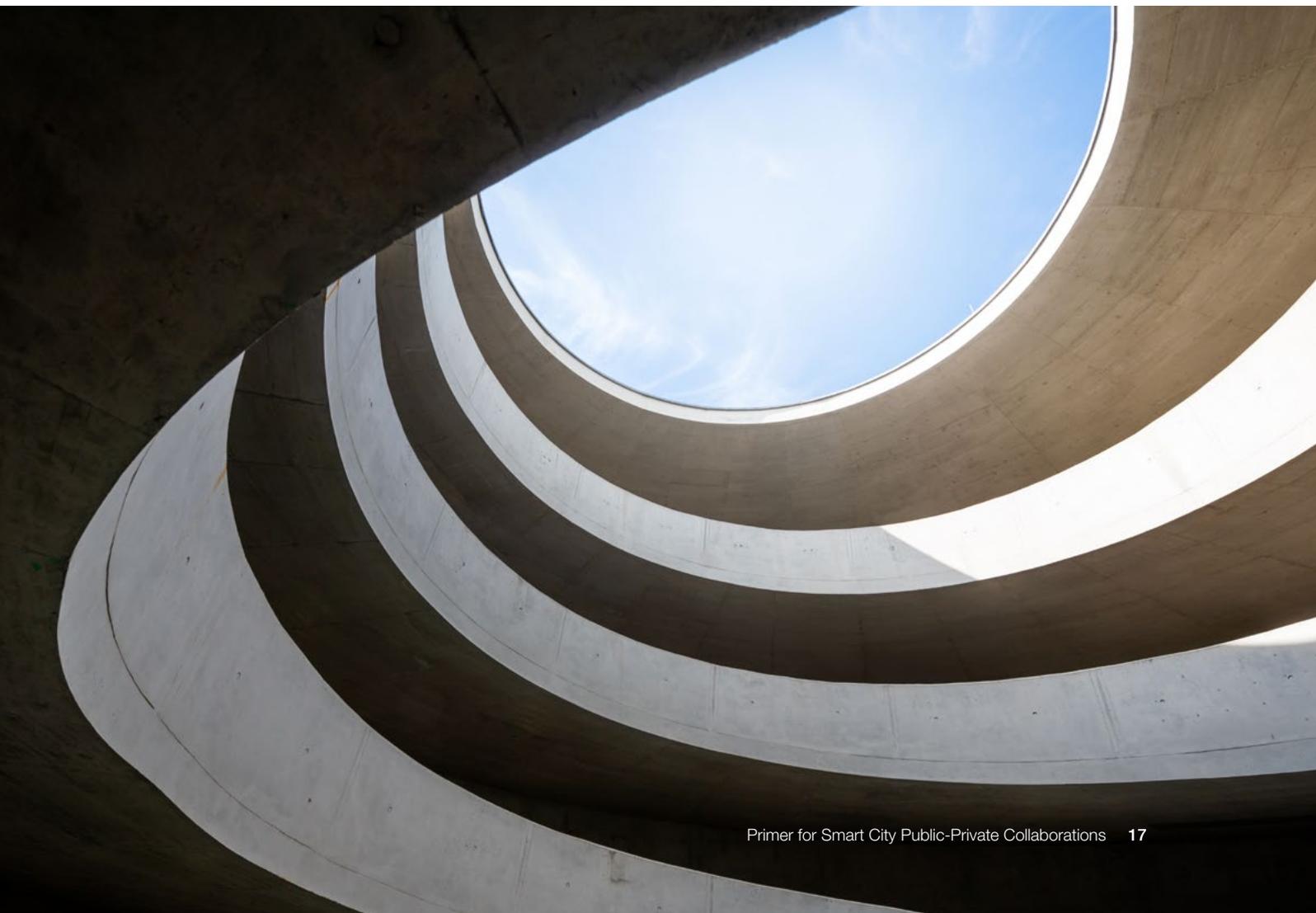
To achieve financial sustainability, successful public-private collaborations must:

- Attract funding from a broad set of stakeholders.
- Obtain funding in a manner that is equitable and fair to all contributors.
- Provide compelling value propositions tailored to each stakeholder group's interests and needs. Particularly the public interest.

- Have a clear set of anchor services and anchor tenants/service providers that will provide the economic returns to make the PPC viable. Most successfully funded PPCs will require an anchor use case that acts as the primary source of revenue/savings for the project.
- Pursue alternative revenue streams and funding models, including co-investment and parallel investment models (given the limitations of strictly donation-based funding).

Co-creation by partners: When partners are empowered early in the process to have a meaningful voice to co-develop the partnership, share insights, expertise and their measures of success, a public-private collaboration. This avoids groupthink, increases buy-in, facilitates a wider range of solutions, and takes full advantage of each organization's diverse benefits.

A shared vision of success and well-defined metrics: Many public-private collaborations fail because partners have over-ambitious goals, cannot align on the targeted outcomes or the metrics are not well defined. The vision of success and how each partner contributes, benefits and monetizes the relationship must be agreed upon and defined upfront, as well as the KPIs and how to measure them, all of which should then be translated into risk-reward mechanisms and incentive structures in the agreement.



Having the right team: Having the right team in place – with a shared understanding of the skills, capabilities and capacity for participation from individual contributors – is crucial to enabling individual organizations to take action and operate within the collaboration at the right place and the right time. Roles and responsibilities must be clear and may evolve as resources and conditions change, so flexibility must be agreed upon in anticipation of these inevitable changes over the life of the collaboration.

Transparent and data-driven decision-making:

Transparent decision-making and data-sharing are essential for stakeholders to understand how to participate, constructively raise concerns, solve problems and translate their expertise and resources into action in pursuit of goals larger than their interests. Also, data-driven decisions for implementation and evaluation are critical to ensuring measurable outcomes and support rapid course correction when necessary.

Flexibility: Long-term agreements need to be structured in a way that enables all parties to amend or review terms or ROI to benefit from new technologies as they come on to the market.

Trust: Trust is important within a partnership, and towards the citizens and community the project is benefiting. A trusted relationship among partners should be developed from the outset before entering into a commercial agreement. That trust should be reflected in the agreement and the ongoing management of the project. A transparent decision-making process, clear roles and responsibilities, clear and measurable outcomes, and data-sharing among partners, over time, contribute to building a trusted relationship and the project's success. Community engagement, access to comprehensive and transparent information about the collaboration, and ensuring partners have good business practices and a reputation for credibility are essential to achieving trust among citizens and the community.

Inclusive and equitable public participation:

A public-private collaboration does not exist in a

vacuum. To implement solutions in the field and achieve ambitious objectives, it must include opportunities for civic communities to become partners in the process themselves. Public participation can provide critical feedback, community buy-in and, at crucial stages, a broader perspective on the challenges and opportunities that will take a PPC from policy to real-world improvements.

Public sector champion: Recognized public figures serve as spokespersons and advocates for leading public-private collaborations, playing a critical role in championing the PPC's value to the public and internal stakeholders.

Integration into wider city planning and policy:

To encourage commitment, future scalability, and alignment with stakeholders, technology deployments should be considered and incorporated into the city's wider plans and policies, particularly for IT and data architecture, privacy, and security. For example, any deployment should be preceded by a [Privacy Impact Assessment](#).

Longevity: Public-private collaboration agreements usually go beyond one political administration. Policies and agendas can change in the process, affecting the projects and sometimes resulting in termination. This area is not much explored, and there are no straightforward solutions. As a recommendation, PPCs should have clear and well-communicated benefits to citizens, and governments could have independent bodies to develop and manage PPCs.

Due diligence with legal and funding requirements:

A public-private collaboration works best when it can navigate through complex compliance frameworks and unpredictable legislative and funding cycles over the life of the collaboration. Careful management, consideration of protocols and ground rules, as well as alignment with legal counsel, acquisition officers, political advisors and other highly specialized contributors should be included early in the process to design for these complicated requirements with careful consideration of incentives and penalties.

5 Towards a policy framework for smart city PPCs

Having a public-private collaboration framework would ensure that the minimum considerations to enable and implement successful PPCs exist. There is no one-

size-fits-all PPC framework that can be applied across different governments because each country has its own policies and regulations.

Policy framework for public-private partnerships

As mentioned in the [World Bank's Public-Private Partnership Reference Guide](#), a comprehensive PPP framework usually includes the following aspects:

- **Policy:** When to use PPPs to deliver public services, and the objectives, scope and implementing principles of the PPP programme.
- **Legal:** How to enter into a PPP agreement, the laws and regulations that set the rules and boundaries for how PPPs are implemented. PPPs are applied through different sectors, and so sector-specific rules and regulations will apply.
- **Processes and institutional responsibilities:** The steps that need to be taken to identify, develop, appraise, implement and manage PPPs.
- **Public financial management approach:** How fiscal commitments are controlled, reported and budgeted for to ensure PPPs provide value for money over time.
- **Other arrangements:** How those responsible for the PPP are held accountable by other entities, such as auditing entities, the legislature and the public.

Smart city public-private collaborations have additional characteristics, which affect the nature of the policy

framework that a city will need to have in place, as shown in Figure 5.

Figure 5

Additional characteristics of smart city PPCs affecting the nature of the policy framework



Non-traditional project parameters: Typically, collaboration agreements must comply with the regulation designed for traditional large infrastructure PPPs. Smart city projects have different parameters and are often smaller scale, with different time scales and budgets, so putting them through a traditional framework could force compliance with unnecessary procedures and paperwork.

Data-dependence: Smart city projects generate substantial amounts of data. Sometimes it is the main outcome of the projects, and other times data is an indirect outcome. In any case, issues of who owns the data, how much value it holds and how to access it arise. These issues should be dealt with at the governmental level by providing the framework for agreements. If left to the negotiation powers of the partners, then value and access could be given away in the process. Other key issues that need to be considered are data sharing, privacy, monetization and insurance.

Cybersecurity: With so much data being created, there is an increased risk of cyberattacks, which can affect critical infrastructure and privacy. There is a critical need for a policy framework at a city or state level that sets the principles to overcome these issues.

Need to test: Technology is a significant component of a smart city project, and applications are often untested. So it is important for cities to have a framework that encourages the co-creation of pilots to test use cases, learn from them and then scale. Regulatory sandboxes and living laboratories illustrate some attempts to implement experimentation of emerging technologies. For example, regulatory sandboxes have been implemented mainly in the financial sector. In the case of smart cities, more careful consideration would be required regarding safety, health and environmental aspects.

Need for collaboration: Innovation and implementation of technology require the collaboration of a diverse set of stakeholders. Co-creation enables sharing expertise, aligning expectations, agreeing on outcomes, metrics, how to measure success, and a better definition of the project scope and its business

case. The policy framework can enable ways for co-creation to take place.

User-centricity: Smart city services are better designed and more responsive to citizens' needs and expectations when they are user-centric. Hence, the governance and institutional frameworks should incentivize and enable a user-centric approach to policy and action. Data is central to this because it provides governments and private sectors with information to better understand what citizens need.

Innovation: Technology is a critical component of smart city projects. It is recommended that governments have a policy framework that encourages innovation, entrepreneurship and start-up development.

Additionally, **legislation** can sometimes prevent smart city collaborations from getting off the ground. Examples of the limitations most often encountered are the following:

- The inability of a city to provide automated citations of any kind (speeding, red light, etc.).
- The inability of cities to enter into revenue share agreements with private companies, especially when data is a key component of the potential partnership.
- The inability of cities to advertise on digital signs in public places.
- Lack of expertise to develop suitable legislation.

Therefore, understanding the limitations ahead of time is extremely helpful, as it can help dictate what revenue drivers and/or savers are best for the city. It provides time to work on deciding whether legislation or policy should be changed to accommodate collaborations that might achieve the city's desired outcomes. Understanding the existing regulation and its impact and then removing legislative hurdles should be the starting point for developing an appropriate policy framework.

Conclusion

Smart city plans need large investments that are difficult to finance with traditional public funds. Public-private collaborations are a feasible choice for tackling public financing shortages and expenditure reduction. However, the use of PPC forms in smart city initiatives is relatively new. This primer document examines the underlying potential for PPCs in a smart city context and revisits some of the principles of PPCs to better understand the process and criteria for building successful PPC projects and to advocate their usage in smart city initiatives. This primer further addresses various issues associated with PPCs, from policy considerations to implementation issues.

This document also introduces the basic structure of a successful PPC policy framework and offers a full overview of the primary characteristics of PPCs that impact the policy framework's nature. A public-private collaboration framework would guarantee that the very minimum criteria for allowing and executing effective projects are satisfied and would assist in the digital transformation of infrastructure to increase efficiency, experience, safety, sustainability and resilience.

The way forward

To date, the G20 Global Smart Cities Alliance has not yet identified a singular model policy for smart city PPCs. However, the alliance has identified several areas where further work is required to properly equip city leaders and their partners with the tools and knowledge that they need to tackle the issues arising from PPCs in the smart city domain. Specifically, feedback from cities and partners has uncovered the need for detailed policy guidance in many of the areas identified as relevant to a policy framework in smart city PPCs:

1. Policy guidance needed for **non-traditional project parameters and innovation:**

- **Business case development that includes the value of data**
References and processes that give decision-makers credible backing for treating data as an asset in the business case process.
- **Partnership models including risk/cost sharing and revenue sharing**
Options for arranging other aspects of a PPC, with particular focus on those that have a significant impact on financial sustainability.
- **Pre-commercial procurement policies and practices**
Policies that unlock innovation procurement so that collaborations can be formed more easily, aligned to fair competition and transparency objectives.

2. Policy guidance needed for **data dependence:**

- **Data governance, ownership and sharing arrangements**
Options for how to govern data generated and used in a PPC.
- **Interoperability requirements for new systems and devices**
Technical requirements that prevent vendor lock-in.

3. Policy guidance needed for **co-creation, user-centricity and the need to test:**

- **Test bed protocols**
Policies needed to designate a test bed district or domain.
- **Collaboration, community engagement and co-design processes**
Processes to ensure projects deliver benefits to key stakeholders, and user-centred design processes to enhance the likelihood of project success.

Policy experts from the alliance working group will scrutinize and prioritize these elements to start working on model policies for release in 2023. Examples of policies for these elements do exist today and can be brought together as individual model policies within the G20 Global Smart Cities Alliance policy roadmap.

As a next step, the alliance is continuing research into data sharing and data governance in PPCs, with a view to publishing a framework for decision-making on data in PPCs.

Furthermore, research conducted to develop this primer has underscored the demand and need for more knowledge sharing for public-private collaborations. Dialogue with cities revealed that this need extends beyond smart city projects – city officers and their potential partners often lack the capacity, tools and skills needed to enable collaboration on transformative

projects, even when these are in well-established or traditional sectors. This is despite the availability of well-developed resource libraries and capacity building programmes, provided by the World Bank and others.

To meet this demand, the World Economic Forum is now exploring the formation of an initiative that will bring together partners from across multiple sectors to offer tools, resources and expertise for public-private collaborations in cities. This initiative will be developed and launched in 2022 at the Urban Transformation Summit in Detroit.

Further reading

Basat, Gunes and Narae Choi, “5 views: What makes a city smart?”, *World Bank Blogs*, <https://blogs.worldbank.org/sustainablecities/5-views-what-makes-city-smart>.

Bertot, John, Elsa Estevez and Tomasz Janowski, “Universal and contextualized public services: Digital public service innovation framework”, *Government Information Quarterly*, vol. 3, no. 2, pp. 211-222, 2016, <https://doi.org/10.1016/j.giq.2016.05.004>.

Centre for Asian Philanthropy and Society, *Public-Private Partnerships for Social Good*, 2021, <https://caps.org/our-research/ppps-for-social-good/>.

Coelho, Miguel, “In need of reform? The future of economic regulation in the UK”, *Institute for Government*, 2015, <https://www.instituteforgovernment.org.uk/blog/need-reform-future-economic-regulation-uk>.

Department of Infrastructure, Transport, Regional Development and Communications, *National PPP Guidelines Overview*, Australian Government, 2008, <https://www.infrastructure.gov.au/sites/default/files/migrated/infrastructure/ngpd/files/Overview-Dec-2008-FA.pdf>.

Kumar, Harish, Manoj Kumar Singh, M.P. Gupta and Jitendra Madaan, “Moving towards smart cities: Solutions that lead to the Smart City Transformation Framework”, *Technological Forecasting and Social Change*, vol. 153, no. 119281, 2020, <https://doi.org/10.1016/j.techfore.2018.04.024>.

Lee, Jung Hoon, Marguerite Gong Hancock and Mei-Chih Hu, “Towards an Effective Framework for Building Smart Cities: Lessons from Seoul and San Francisco”, *Technological Forecasting and Social Change*, vol. 89, pp. 80-99, <https://www.sciencedirect.com/science/article/abs/pii/S0040162513002187>.

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Endnotes

1. Sasse, Tom and Nick Davies, “Outsourcing and privatisation”, *Institute for Government*, 7 August 2020, <https://www.instituteforgovernment.org.uk/explainers/outsourcing-and-privatisation>.
2. “San Diego switches to ‘green’ street lights”, *The San Diego Union-Tribune*, 19 September 2011, <https://www.sandiegouniontribune.com/news/environment/sdut-san-diego-swatches-green-street-lights-2011sep19-htmistory.html>.
3. “OnDijon, métropole intelligente et connectée”, *Dijon Metropole*, 2019, <https://www.metropole-dijon.fr/Grands-projets/Les-grandes-realizations/OnDijon-metropole-intelligente-et-connectee>.
4. Enginger, Hélène, “On Dijon, smart metropolis”, *Construction 21 International*, 16 June 2019, <https://www.construction21.org/infrastructure/fr/on-dijon-smart-metropolis.html>.
5. World Bank, *Kazakhstan: Energy Efficiency Transformation in Astana and Almaty*, 2017, <https://openknowledge.worldbank.org/bitstream/handle/10986/28927/121463-ESM-P130013-PUBLIC-KEEPAlmatyEEPlanNovengfinal.pdf?sequence=1%26isAllowed=y>.
6. Data strategy is referred to as the ownership, privacy, security, quality, ethics, rights and responsibilities, risks, and overall management of the data collected.



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