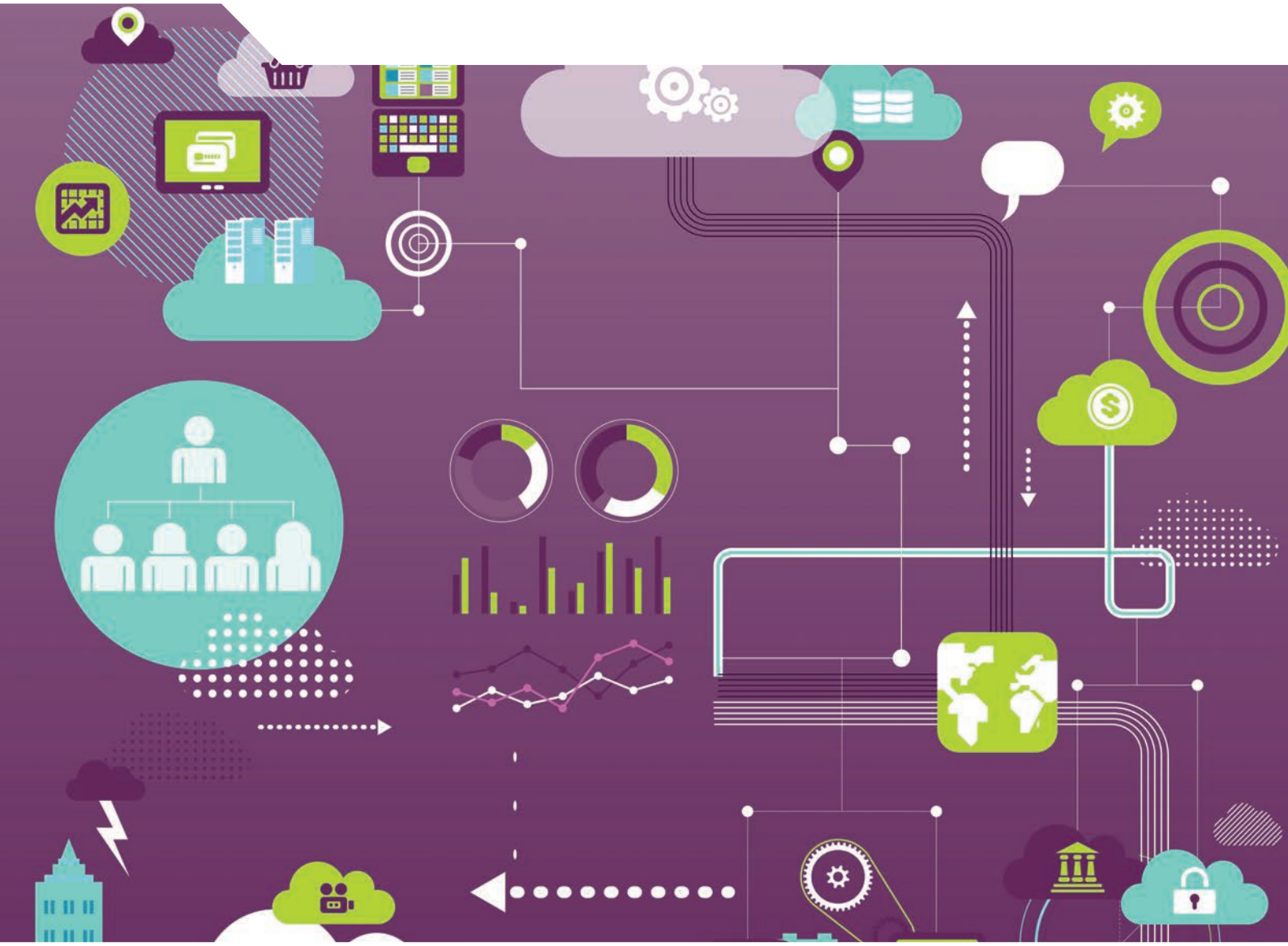
Innovation and Data Use in Cities

A ROAD TO INCREASED WELL-BEING



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Preface

As the COVID-19 pandemic took hold around the globe, city governments leapt into action implementing measures such as social distancing, lockdowns, and established teleworking protocols. Cities also launched specific initiatives, often in parallel with national ones, to support economic recovery, maintain the continuity of local public service delivery (including targeted services for vulnerable groups), and provide access to amenities and the reopening of public spaces consistent with COVID-19 safety protocols. Leveraging digital and communication tools, cities innovated as if their residents' lives depended on it—because they did. While city leaders demonstrated agility in providing rapid and concrete responses to contain the devastation of the pandemic, they also looked to build future resilience by preparing for the shift to new urban paradigms favouring flexibility and adaptability, shifting focus from mobility to accessibility, and understanding how to fully harness the digital transition.

Empowering cities to innovate is a long-standing priority of both Bloomberg Philanthropies and the OECD. It is also a primary focus of the partnership between our two organisations for several years—to glean and share insights from the practical experience of hundreds of mayors, city leaders and stakeholders around the world.

While many innovation stories document the successful outcomes in individual cities, *Innovation and Data Use in Cities: A Road to Increased Well-being* provides comprehensive analysis on the range, shape, and results of innovation efforts in 147 cities. This report is the first of its kind to provide evidence on how cities' investments in innovation and data can improve the well-being of residents. It also shows that cities with higher public sector innovation capacity have higher levels of city and life satisfaction. Furthermore, across key well-being dimensions from housing to environment, health and walkability, it uncovers that cities with higher innovation capacity and data practices outperformed cities with lower innovation and data use capacity.

The world's cities and their residents have been subject to an extraordinary test over the last 18 months. And they will be tested again as we seek to recover from the aftermath of the pandemic. This report, reflecting the efforts in dozens of cities by thousands of city stakeholders, demonstrates that by continuing to evolve capacities to use data and reinforcing a culture of innovation, city governments are, more than ever before, ready for the challenge.

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Foreword

Innovation and Data Use in Cities: A Road to Increased Well-being is part of a four-year collaboration between the OECD and Bloomberg Philanthropies to understand the source, structure, and environment that allow local public sector innovation to flourish.

The 2019 the OECD/Bloomberg Philanthropies report *Enhancing Innovation Capacity in City Government* was the first to answer two questions about local public sector innovation: (1) why city governments develop the capacity to innovate and (2) how they do it. The results of that research highlighted a wide range of approaches to innovation across the 89 cities surveyed.

Some cities associated innovation with human-centred design, while others emphasised experimentation, or use of data analytics. But more striking was the convergence on what matters for innovation, where all cities reported leadership support as a success factor for local public sector innovation. Another common thread throughout the approaches, initiatives, policy sector choices for innovation, and definitions expressed by cities, is the use of innovation to improve well-being. However, only 16% of cities reported systematic and comprehensive evaluation of their innovation outcomes.

As a follow-up to that study, this report seeks to document the extent to which investment in innovation and data use improves well-being outcomes for residents. With a survey covering 147 cities, over an expanded geography and a more diverse range of cities, it allows for more insights and diversity of experiences, priorities, and approaches than the earlier survey. A key finding of the report is that cities with high innovation capacity and high data use practices scored better across 11 well-being dimensions, such as environment, housing, and city and life satisfaction.

In the middle of the project, the COVID-19 crisis hit local governments and leadership, and quickly, with profound impacts on a range of local services. In response to the pandemic, city governments demonstrated their agility by deploying innovation and data use in countless ways, from keeping public services available through digitalisation to promoting socially distant transport modes to contract tracing. While developing innovation and data use capacity had been just one of several priorities for cities beforehand, COVID-19 forced many cities into doing so at a breakneck pace—and demonstrated their value in the process. As cities gradually emerge from the worst of the crisis, action will be needed to cement gains made in innovation and data use competencies beyond COVID-19 response such as increasing data use capability, establishing a culture of innovation among all city staff, and securing the right human, financial, and institutional resources to continually improve resident well-being beyond the pandemic.

Acknowledgements

This report was prepared by the OECD Centre for Entrepreneurship, SMEs, Regions and Cities (CFE), led by Lamia Kamal-Chaoui, Director, as part of the programme of work of the Regional Development Policy Committee (RDPC). It is the result of a two-year policy dialogue between the OECD and Bloomberg Philanthropies, which engaged 147 cities around the globe.

The report and underlying policy dialogue were spearheaded and co-ordinated by Sena Segbedzi, Co-ordinator of the OECD Champion Mayors Initiative (CFE), under the supervision of Aziza Akhmouch, Head of the Cities, Urban Policies, and Sustainable Development Division (CFE). The report was drafted by a team of OECD policy analysts composed of Andrew Lombardi (Chapters 1, 2, 4, 5), Marcos Díaz Ramírez (Chapters 1, 2, 3), Vu Tran (Chapters 3, 4, 5) and Maria Paula Caldas (Chapters 1, 2, 3). Paolo Veneri, Head of the Territorial Statistics and Analysis unit (CFE) and Rudiger Ahrend, Head of Economic Analysis, Data, and Statistics Division (CFE) provided oversight for the data and statistical components. Natalia Altman contributed to updating the survey instrument and deep engagement with respondents during the data collection phase.

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Executive summary

Innovation and data-use have proven to be vital tools in cities' responses to the COVID-19 pandemic. The use of innovation tools such as experimentation, digital services, human-centred design, real-time data sharing and alternative communication channels in day-to-day operations and management became widespread in response to the pandemic. And just as innovation and data use have played a role in response measures, they are also playing a role in recovery efforts and building resilience, helping localities address long-standing inequalities exacerbated during the pandemic, ensuring better access to vital goods and services, reinforcing the need to shrink digital divides, and moving local governments towards a more sustainable future.

This report is the first to link cities' innovation capacity and data use with resident well-being at the local level. Its findings draw on the OECD/Bloomberg Philanthropies Survey on Innovation Capacity across 147 cities covering the US, Europe, South America, Asia, Africa, and Oceania. The survey results, combined with data use assessments of 100 cities from the *Results4America What Works Cities Certification programme,* and dedicated city-data collection on resident outcomes, was guided by the OECD's well-being measurement framework. Key findings from the report include:

- **Higher levels of public sector innovation and data use practices correlate to higher levels of city and life satisfaction among residents.** The proportion of people who report being satisfied or very satisfied with their city is four percentage points higher in cities with high public sector innovation scores than in those with low scores. Similarly, the proportion of citizens satisfied or very satisfied with their life is 1.5 percentage points higher in cities with high public sector innovation scores than in their low-score counterparts. This holds true even when accounting for city size and economy.
- **A holistic approach that includes all city departments in innovation work pays off.** Cities that reported taking a holistic approach showed higher levels of city satisfaction among residents, on average. However applying innovation to singular policy areas is a common practice. A quarter of responding cities concentrate their innovation capacity in specific policy areas; transport and mobility, digital governance, and economic development emerged as policy areas where innovation is most applied. While focus on a specific policy area can help cities assess direct causal relationships within their innovation investments, this sector-specific approach may detract from building a more widespread culture of innovation.
- **A dedicated innovation team within city government also seems to be effective across the cities surveyed.** Residents of cities with dedicated innovation staff showed levels of city satisfaction nine percentage points higher than those without one. Dedicated innovation staff also proved to be the most common approach to building innovation capacity within cities as 90% of cities report having an innovation team. Furthermore, certain skillsets appeared across innovation staff in cities: globally. Innovation teams comprised staff with project management skills (92%), followed by data science (66%), and community engagement (62%).

- **Life satisfaction is positively linked to cities who engage stakeholders and residents in data collection, and city satisfaction to those that openly share their data.** This suggests a virtuous cycle can develop when cities make data available and work with potential data users to make the data serviceable. Cities that engaged in the highest levels of stakeholder engagement scored four percentage points higher in resident life satisfaction than other cities. Likewise, the difference in the share of residents satisfied with the city is five-and-a-half percentage points between cities with strong versus weak open data practices

The report spotlights where cities have room for improvement. Many fell short in performing systematic evaluations of their innovation outcomes, which can help cities refine and improve their overall strategies. Similarly, while most cities possess sufficient cross-sector data, many do not yet leverage that data to measure the impact of their actions. However the silver lining is that most cites have innovation teams in place, and the evidence shows that the integration of data and evaluation of innovation outcomes arises as teams mature. For instance, teams in place for five years or more have higher rates of systematic evaluations and monitoring of their innovation work than their more nascent counterparts.

The report calls for city governments to unlock the potential of five components of innovation capacity–(1) strategy, (2) structure and staff, (3) funding, (4) data, (5) evaluation and monitoring–which must be approached in concert to maintain the innovation and data use momentum cities generated during the pandemic. To help cities source and structure their innovation and data use capacity to enhance residents' well-being, the report offers ten policy recommendations:

- **Innovation should come from a plethora of city stakeholders: leadership, staff and residents.** While leadership is vital to innovation activity, sourcing innovation from staff and residents is essential to drive direct, robust co-creation, and to empower city staff with institutional knowledge and place-based experience and testing.
- **Nurture a culture of innovation throughout the city, so it becomes second nature.** Expanding innovation skills beyond the core innovation team, promoting experimentation and calculated risk-taking can ensure that all public employees work innovatively. Such widespread efforts to build a culture of innovation can end departmental silos, promote inter-agency collaboration and reduce friction around programme implementation.
- **Create a formal, publicly shared innovation strategy with measurable goals.** Cities must define what innovation means in their local context, adopt a formalised strategy and set concrete outcome-oriented goals to evaluate throughout the innovation process.
- **Plug innovation staff into the larger administration for maximum impact.** Cities can use hiring and professional development to equip administrative employees with the skills and experience necessary to improve resident well-being through innovation.
- **Focus on stable, long-term funding to protect against short-term shifts.** Although innovation funding is essential, exorbitant budgets are not. Cities with strained budgets can innovate if they are realistic about what they can accomplish, explore partnerships and keep consistency across leadership or staff turnover.
- **Leverage data use for decision-making and evaluating outcomes.** To verify whether innovation improves resident well-being, data use plays a central role in monitoring and evaluating innovation by allowing cities to re-allocate resources, staff and funding based on facts and figures rather than hunches or politics.
- **Establish a data strategy that defines roles, goals, and expectations.** A systemic, flexible and well-conceived data strategy can ensure accountability and transparency, define leadership roles, set measurable objectives and outline expectations.
- **Cultivate the capacity for coherent implementation of data strategies.** Cities' capacity for coherent implementation of data strategies, policies and initiatives can be cultivated through elements such as data skills and staff capabilities, data openness and stakeholder engagement.

- **Establish a well-defined legal and regulatory data framework.** Cities need to consider the legal and regulatory aspects of data, from technical and organisational standards of compliance to data-related rules and guidelines that ensure openness, protection, transparency and accountability.
- **Meet high data management standards during daily operations.** Local governments should be fully aware of the practical implications, risks and barriers to optimal data use at each stage of the data value cycle. By mapping the flow of city data–from unprocessed data to information and insights for decision making–city administrations will be able to navigate and unlock the full potential of their strategic assets.

1 Connecting cities' innovation and data use to residents' well-being

Based on previous research, literature and case studies, this chapter provides an overview of public sector innovation and data use in city government, and their potential to help cities improve residents' well-being. The chapter proposes that, while anecdotal evidence suggests local public sector innovation and data use can improve residents' well-being, such outcomes are not guaranteed. By developing certain innovation and data use capacities, cities can increase the likelihood that these activities will improve residents' lives. However, despite growing interest in local public sector innovation and data use, a system to evaluate how they correlate with residents' well-being does not yet exist. This chapter concludes by introducing an OECD methodology to connect the dots between local public sector innovation, data use and well-being, the findings of which are reviewed in later chapters.

Previous work assessing innovation capacity in city government

Around the globe, cities are embracing innovation and data use to support how they run the city and address residents' needs. The OECD/Bloomberg Philanthropies (2019[1]) report, *Enhancing Innovation Capacity in City Government*, focused on why local public sector innovation occurs in cities, what drives it and where innovation is expected to deliver better outcomes for residents.

The 2019 report also established an analytical framework for assessing public sector innovation capacity. Tenets of this framework included a strategic approach (including clear goals), organisational and staff structure, data management capacity, openness to partnerships and the importance of evaluating innovation outcomes. That framework laid the foundation for this report, which analyses the impact of cities' innovation activity on residents' well-being through five components: (1) strategy, goals and approaches; (2) organisational and staff structure; (3) funding; (4) data use; and (5) outcome evaluation (Box 1.1).

Following the next steps laid out in that report, this report incorporates results from the 2018–20 OECD/Bloomberg Survey on Innovation Capacity on Cities (Box 1.1) and the What Works Cities (WWC) Assessment (Box 1.2) to dive deeper into cities' data use and its impact alongside innovation capacity on residents' well-being, and provides recommendations for policy makers to leverage these approaches for improved outcomes. A dedicated website mapping innovation capacity in cities is also publicly accessible at https://cities-innovation-oecd.com/.

Box 1.1. Background of the 2018–20 OECD/Bloomberg Survey on Innovation Capacity in Cities

Overview and intent of the Survey

In 2018, the OECD and Bloomberg Philanthropies joined forces to assess how cities around the world develop their capacity to innovate. To support this research, a Survey on Innovation Capacity in Cities was developed and sent to over 100 cities worldwide. Survey results featured in an online innovation platform and were analysed in the 2019 report *Enhancing Innovation Capacity in City Government*.

Building on these successes, the OECD/Bloomberg team launched a second project phase in 2020 with an updated survey to deepen understanding of data use and innovation capacity in cities, and how they generate better well-being outcomes for residents.

Innovation components examined by the Survey

The 2020 OECD/Bloomberg Philanthropies Survey, like its 2018 predecessor, comprised five sections designed to capture why and how cities invest in and manage their innovation and data-use capacity:

- **Innovation definition, goals, and approaches:** Examines how cities build and maintain innovation capacity; what innovation means to each city; and what are cities' goals, strategies and approaches.
- **Organisational and staff structure:** Examines how innovation work is organised and staffed within city administrations, e.g. whether an office or certain staff is dedicated to innovation.
- **Funding and resources:** Examines funding and resources dedicated to developing and maintaining cities' innovation capacity (as distinct from funding for programmes), e.g. to expand innovation staff.
- **Data use for innovation.** Examines how each city generates, manages and/or shares data.
- **Outcomes monitoring and evaluation:** Examines whether and how cities assess outcomes related to their innovation strategy and goals.

Changes and additions in the 2020 version of the survey

A combined 147 cities responded to the 2018 and 2020 versions of the survey. To gain deeper insights into each innovation component, 24 new questions were added to the 2020 version. Eighty-nine cities answered the 2018 survey, while 70 answered the 2020 version. Of the latter 70 cities, 12 had also responded to the 2018 survey version, while 58 were completely new respondents. In addition, another 13 cities that had responded to the 2018 survey version also responded to an abridged version of the 2020 survey, containing only the 24 new questions.

This hybrid approach was designed to facilitate participation in the updated 2020 survey, allowing for a wider analysis in this report by using responses to both versions. The list of respondents can be found in Annex 1.A.

Source: OECD/Bloomberg (2018-20), Philanthropies Survey on Innovation Capacity in Cities; OECD (2019[1]), *Enhancing Innovation Capacity in City Government*, OECD Publishing, Paris, https://doi.org/10.1787/f10c96e5-en.

Box 1.2. Background of the What Works Cities Performance Assessment

Overview and intent of the WWC Performance Assessment

Launched by Bloomberg Philanthropies in 2015, What Works Cities (WWC) aims to enhance cities' ability to use data and evidence to address challenges and improve residents' lives. Eligible cities can receive free support through the programme, including an assessment of their data practices, access to strategic resources, connection to a network of cities, technical assistance, coaching, etc.

Practices examined by the WWC Performance Assessment

The WWC performance assessment framework uses 45 criteria, grouped under eight foundational practices, to measure the extent to which leaders incorporate data and evidence in city management and decision making. These include:

- **Data governance (5 criteria):** Governance of data within city administration, e.g. keeping a comprehensive data inventory, documenting data governance responsibilities, etc.
- **Evaluations (5 criteria):** Use of data to evaluate practices, programmes or policies.
- **General management (9 criteria):** Support for data and evidence by city leadership, and the existence of staff dedicated to developing/implementing data-use programmes and strategies.
- **Open data (4 criteria):** Local government's commitment to sharing data publicly.
- **Performance and analytics (7 criteria):** Use of data to monitor performance and advancement toward strategic goals.
- **Repurposing (4 criteria):** Use of data by local government to efficiently allocate, re-allocate or discontinue programmes.
- **Results-driven contracting (7 criteria):** Use of data by local government to inform and evaluate key procurements, contracts and/or grants.
- **Stakeholder engagement (4 criteria):** Local government's commitment to engage with data users (residents and partners) in the design and implementation of data policies and practices.

Source: What Works Cities (2018[2]), "What Works Cities Assessment Guide: Certification Criteria", https://medium.com/what-works-cities-certification/what-works-cities-certification-assessment-guide-5c514f1dff1b (accessed on 14 January 2021); Bloomberg Philanthropies (2020[3]), "What Works Cities", website, https://whatworkscities.bloomberg.org/ (accessed on 18 January 2021).

Public sector innovation and data use can improve residents' lives

Facing myriad societal challenges, the public sector is embracing innovation to improve internal operations and service delivery in hopes of yielding better outcomes for residents. There is growing interest in the potential of public sector innovation to "improve the efficiency in how resources are used, the quality of public services, and address a diverse range of societal challenges, including climate change, demographic pressures, urban congestion and social and economic inequality" (Arundel, Bloch and Ferguson, 2019[4]). Public sector innovations, executed through a variety of avenues and actors "typically improve services, sometimes in an impressive manner" (Goldsmith and Kleiman, 2017[5]). However, while municipal-level public sector innovation "has begat some of the most inventive policy…precisely because the trash has to be picked up even when the budget is getting squeezed," a "thorough literature review finds few texts that assess the current wave of local innovation" (Goldsmith and Kleiman, 2017[5]).

The public sector's interest in data has increased as well. This interest accelerated thanks to socio-economic and technological trends, including the growing capacity for data generation and collection, the power of data analytics, and the paradigm shift in knowledge creation and decision making. Data is increasingly leveraged to increase productivity, anticipate future trends and risks, improve local service delivery and inform decision making more broadly. The OECD report *Data-Driven Innovation* (2015[6]) affirms that "better access to and use of public sector data can lead to important value creation from economic, social, and good governance perspectives." Data analytics can also help city governments "predict the causes of problems rather than just responding after they occur" (Goldsmith and Kleiman, 2017[5]).

Such benefits of public sector innovation and data use might be valuable for cities, which find themselves "under pressure to provide high-quality services to residents in cost effective ways" in the face of "increasing citizen expectations, decreasing government budgets, and changing demographics" (What Works Cities, 2015[7]). In a demanding time that requires municipal governments to do more with less, one solution is to leverage innovative practices such as qualitative and quantitative data, human-centred design and strategic partnerships to determine the programmes and services that work best for residents. The need to make city operations more efficient and services more accessible became even more imperative in the context of the COVID-19 pandemic.

Properly deployed, public sector innovation and data use can help cities respond to these challenges by generating public value that improves residents' well-being. This value may include economising resources through internal efficiency, targeting service delivery (including digitally), facilitating resident engagement and feedback, informing cities' plans for future challenges and supporting government transparency and accountability. Chapters 2 and 3 explore the potential for innovation and data use to create this value.

Unique aspects and challenges to public sector innovation

A methodology to measure public sector innovation is essential to evaluating its impact on well-being, but first requires a definition of public sector innovation. Public sector innovation is about "finding new ways to improve society, government itself, and the relationship between government and the public" (Janssen et al., 2017[8]).

While the 2005 Oslo Manual (OECD/Eurostat, 2005[9]) presented a measurement framework for innovation, it only applied to the business sector, despite innovation's growing presence in the public sector as well (OECD, 2015[10]). Meanwhile, increased attention paid to innovation occurring in the public sector "has attracted a growing body of empirical research, motivated in part by the increasing demand for benchmarking the efficiency and quality of public services as well as identifying the factors that contribute to desirable innovation outputs and outcomes" (OECD/Eurostat, 2018[11]).

In response to this developing body of research "adapting the guidelines in the [2005 edition of the Oslo Manual] to develop surveys of innovation in public administration organisations", the 2018 Oslo Manual provided a "conceptual framework and general definition of innovation that is applicable to all sectors in the economy", including government and the broader public sector (OECD/Eurostat, 2018[11]). The 2018 Oslo Manual thus defines innovation as "a new or improved product or process that differs significantly from the unit's previous products or processes, and that has been made available to potential users or brought into use by the unit" (OECD/Eurostat, 2018[11]).

Compared to the private sector, policy interest in public sector innovation concerns "how innovation occurs in order to increase its use to solve problems and improve outcomes", including for residents (2019[4]). Public sector managers express that "innovation must make something better or have a goal to deliver better outputs". Thus, this report uses the same definition of public sector innovation (Box 1.3) as the OECD and Bloomberg Philanthropies' (2019[1]) report, *Enhancing Innovation Capacity in City Government,* based on research by the OECD Observatory of Public Sector Innovation (OPSI) and the *Oslo Manual of Innovation*.

Box 1.3. Defining public sector innovation

Consistent with the OECD and Bloomberg Philanthropies' 2019 report, *Enhancing Innovation Capacity in City Government*, this report defines public sector innovation as any service or product that has the following characteristics:

- **Novelty,** as innovations introduce new approaches where they are adopted.
- **Implementation,** as innovations must be put into practice.
- **Impact,** as innovations aim at better public results.

Source: OECD/Eurostat (2018[11]); OECD (2015[10]); OECD (2019[1]).

Cities value innovation and data use, but residents don't always benefit

As Chapters 2 and 3 will explore in depth, cities increasingly embrace the potential of innovation and data use to improve their residents' lives. According to the 2018 OECD/Bloomberg Survey responses, a majority of cities dedicate staff and funding to innovation, and half of them already adopted formal innovation strategies. In addition, 81% of cities report that data plays an important role in their innovation efforts and decision making, while more than seven out of ten cities publish open data online and share city data on public procurement in the name of transparency.

Most surveyed cities report that public sector innovation helps them improve service delivery and internal operations, anticipate and manage future challenges, improve resident outcomes and generate other benefits. Surveyed cities report successes that manifest in multiple ways, thanks to their innovation and data endeavours. Local public sector innovation shows potential to improve residents' well-being (Box 1.4), whether that means using human-centred design to inform legislation on new forms of urban mobility (Seattle, WA, United States), leveraging smartphone GPS data to improve road conditions (Dublin, Ireland), or establishing a forum for co-creation that directly engages the community (Leipzig, Germany). However, while these examples imply tangible benefits for residents, many cities struggle to develop capacity in areas related to public sector innovation and/or data use—including key components that could demonstrate impact.

Box 1.4. How cities leverage public sector innovation and data to improve residents' well-being

Using innovative approaches to change the culture of the city

In Leipzig, Germany, the "Leipzig Thinking Ahead" initiative serves as a co-ordination vehicle for civic participation, bringing together residents, elected officials, policy makers, and experts to address sustainable urban development. Leipzig Thinking Ahead fosters a culture of resident engagement and co-creation through virtual events, a future-planning series, conducting surveys, and even providing the use of Legos for residents to construct their own vision for the city.

Seattle, WA, United States, uses human-centred design to engage rideshare drivers and better understand their needs and preferences in relation to potential legislation on minimum compensation. The city designed an ethnographic outreach and engagement strategy that included intercept interviews, focus groups, a telephone town hall, and an online survey. By including perspectives from rideshare drivers, Seattle ensured that innovation efforts put them at the centre.

Moscow, Russia, has used the Our City portal since 2011. The electronic platform allows Muscovites to influence the timeliness and quality of repair work, report on maintenance conditions of urban facilities, report violations and evaluate the work of institutions. Citizens also monitor the work of the metro, the cleanliness of yards and parks, conditions at construction sites and in public transport, the work of clinics and prices in pharmacies. Since the portal's creation, more than four million urban problems reported were resolved.

Leveraging data and digitalisation to increase safety and inform decision making

In Godoy Cruz, Argentina, the Sistema de Alerta Comunitaria (Community Alert System) app allows residents to notify a 24-hour monitoring centre of safety or health dangers. These warnings are vetted and broadcast to other cell phones in the area, giving advance notice to neighbours and saving lives. The app is used in over 10 000 households and is being replicated by other cities across the country.

Dublin, Ireland, has engaged in several Small Business Innovation Research (SBIR) challenges, including one focused on improving the cycling experience in the city. This SBIR led to the development of a bike light using sensor technology that gathers data on road surface quality, frequently used routes, and near-miss incidents to improve Dubliners' cycling experience and inform decisions on new infrastructure plans. The initial trial collected data from 200 participants, presented to the city as an easily readable dashboard.

Montgomery, AL, United States, created a programme to identify and prevent blighted and abandoned properties by combining and analysing data from utility partners and housing codes.

Source: OECD/Bloomberg (2018-20), Philanthropies Survey on Innovation Capacity in Cities.

Uptake of innovation and data use has accelerated, but evaluation lags

At least half of surveyed cities report having three of the five components integral to innovation: a formal strategy, dedicated staff, and funding. In addition, nearly half of surveyed cities report systematic assessment or evaluation of some, but not all, impacts of either their innovation strategy or its outcomes. (It is likely that other surveyed cities conduct *ad hoc* evaluations of innovation activity despite not having a formalised strategy.) However, consistent with responses to the 2018 OECD/Bloomberg Survey (2019[1]), only 16% of cities report a systematic assessment or evaluation of both the impact of their innovation strategy and outcomes—making it the least common of the five components among surveyed cities.

This relative dearth appears consistent with the broader research landscape on local-level public sector innovation, which "has been descriptive in nature, often detailing programme elements rather than critically assessing new innovations or placing them in a larger context" (Goldsmith and Kleiman, 2017[5]). It is also significant, considering that evaluation of innovation strategy and outcomes help cities refine innovation implementation for greater impact, determine whether programmes and policies are working, guide budget and policy decisions, and advocate for more funding. Evaluating innovation outcomes can ensure public accountability and foster trust in city leaders, allowing voters to assess the results of a given innovation investment and voice their opinion on whether it should be continued. Without a method to systematically assess innovation outcomes, city governments cannot build evidence that innovation activity improves residents' lives. According to Demircloglu (2017[12]), "there is not much established or well-developed research, theories, and cases that inform us of the conditions, types, measurement, outputs, and outcomes of innovation in the public sector context."

The five public sector innovation components examined by the Survey (e.g. strategy, staffing, funding, data use and evaluation) are interdependent: building robustness in each component increases the likelihood that a city's innovation will have deep and lasting impact. For cities to develop a strong evaluation capacity, they might first need a strategy that sets measurable goals, staff to perform programme assessment, funding to support staff, and basic data skills to draw quantifiable conclusions beyond anecdotal case study-type observations. Cities may struggle to build a system of assessment or evaluation of innovation if these other components are poorly developed.

Obstacles to evaluating innovation

Although cities might argue that evaluation capacity lags due to underdevelopment of the other components, it more likely indicates the need for a cultural shift of the public sector at large toward quantitative assessment, beyond just innovation. According to the 2020 OECD report *Innovation for Development Impact* (OECD, 2020[13]), even in countries "where an evidence culture is strong, the role of monitoring, evaluation and learning in innovation is weak…there is not yet a culture of evidence-based innovation—evaluation and evidence are often absent."

Another obstacle to developing evaluation capacity lies in the wide-ranging applicability of innovation. Because some of the most significant outcomes of municipal government activity are qualitative – such as increased resident engagement, a higher sense of safety, or improved satisfaction with community outreach – cities may struggle to quantify and measure impact despite having some data on hand (Figure 2.23). Evaluating intangible outcomes is a challenge across the public sector, including for innovation. The 2018 *Oslo Manual* elaborates that:

> *The absence of a market alters both the incentives for innovation and the methods for measuring innovation outcomes [in the public sector] compared to the business sector. Without data on the cost or price paid for government services, outcome measurement has relied on subjective, self-reported measures, such as an increase in efficiency or improved user satisfaction (Bloch and Bugge, 2013). High-quality outcome measures are generally only available for specific innovations. Examples include the cost and benefits of new treatments or protocols in hospitals or new educational methods in schools. (OECD/Eurostat, 2018[11])*

Examples from surveyed cities in Chapter 2 (e.g. Box 2.1, Box 2.2, Box 2.5) provide some quantitative evidence of innovation outcomes, but may fail to capture the full scope of those innovations' impacts on resident well-being.

Another difficulty measuring –and especially comparing–public sector innovation at the city level through a quantitative universal framework is that such activity is most often hyperlocal, place-based, and context-specific. For example, the impetus for innovation in various cities featured in Box 1.4 differ greatly: Leipzig, Germany responded to calls for sustainable urban development while Godoy Cruz, Argentina prioritised resident safety, and Seattle, United States addressed fallout from a shock to the local labour market. While cities frequently face common problems, the nuances around specific local issues can influence the

approaches that cities take, making it difficult to compare innovation activity on any universal scale. Even when quantifiable metrics exist around outcomes, the contextual incongruence of local-level innovation may complicate efforts to glean meaningful insights.

Establishing causality also poses a challenge. As discussed later in this chapter (see Methodological considerations and caveats), while this report strives to correlate public sector innovation components and data use practices to resident well-being outcomes, causality cannot be assumed for several reasons. While the analysis in this report corrects for certain factors, others yet unobserved might contribute to innovation outcomes.

Progress toward evaluation of innovation outcomes

While "challenges related to the measurement of public sector innovation are multiple and non-trivial" (OECD, 2015[10]), cities appear to be working toward greater evaluation capacity. Certain signs exist, including the 2018 OECD/Bloomberg Survey results that suggest cities with older innovation teams evaluate innovation outcomes and/or strategy at a higher rate than cities with newer teams (Table 2.2). Likewise, cities with newer innovation teams report not evaluating innovation outcomes or having no formal innovation strategy whatsoever at a higher rate than cities with older teams. These survey results and others suggest that cities are in fact evaluating outcomes, and the more present certain factors are (e.g. the tenure of innovation teams, access to stable funding, ongoing staff training, and rigorous data practices), the more they may evaluate outcomes. (For more on these trends, see "Evaluating outcomes can create feedback loops that lead to greater impact" in Chapter 2.)

Another sign that surveyed cities are increasing their evaluation capacity is that half report an innovation strategy and/or formal innovation goals–both foundational to fostering a culture of outcome assessment. This is significant because the trends identified in cities' current and future innovation funding plans imply that most first prioritise establishing an innovation strategy and team, then pivot to building data use and evaluation capacity afterward (Figure 2.11).

Surveyed cities also report measuring the outcomes of innovation efforts in at least ten distinct categories to varying degrees (Figure 2.22). Though none of these categories are measured by a majority of cities, these findings suggest progress.

Data use is recognised as a valuable tool, but its application remains elusive

In recent years, local governments increasingly recognise the critical role that data can play in improving well-being outcomes for residents. Data use could also play a role in evaluating public sector policy and activity: "incorporating more sophisticated analytic tools will assist cities in a shift from measuring narrower activities to more systemic issues" (Goldsmith and Kleiman, 2017[5]).

This growing interest is partly due to the potential for leveraging the swaths of available data for insights into the behaviours, preferences, needs and difficulties of residents, businesses and public services in the city. As part of their daily operations, local governments generate and assemble a massive quantity of data with diverse forms and characteristics. Meaningful insights derived from this data could contribute to the processes of knowledge creation, innovation and policy making.

Nevertheless, data use is the second scarcest innovation component after outcome evaluation among surveyed cities. Just 39% of cities report that data plays a significant role in their innovation efforts and decision making, and less than half report using data to align budget processes with strategic priorities. While data use has a strategic role in supporting innovation, developing data capacity and culture within the public sector could also have positive impacts in other areas of budget and policy decision making, staff and resource allocation, programme evaluation, future risks anticipation and management.

Despite cities' increased awareness and interest in leveraging data to guide decision making and inform policy, the potential of a data-driven public sector still eludes most governments. Building a data-driven culture within public sector organisations can be an intensive process. At every stage along the government-data value cycle, municipalities face diverse challenges and risks at the strategic, organisational and technical levels. From the lack of strategic data leadership and vision to insufficient staff with data capacity, suboptimal deployment of data can have broader implications for cities' governance beyond innovation. Surveyed cities describe various obstacles to optimising data use for innovation, including a lack of data compatibility across policy areas, a lack of staff capacity to collect data, and that data are not shared among agencies. In addition, while it can take time to see tangible results in many cases, interruptions to the process might be encountered due to inconsistent or insufficient funding, mayoral or administrative turnover that deprioritises data use, or unforeseen events like COVID-19 that trigger a shift in resource allocation.

Other barriers to using data to inform decision making in city government include: a lack of staff and financial resources; limited knowledge and expertise in data; a lack of trust in data generated by city systems; old and incompatible systems for data collection and analysis; and challenges obtaining buy-in from stakeholders (What Works Cities, 2015[7]). Cities can also face regulatory hurdles around data, such as the lack of an enabling framework for data sharing across organisations and/or with other levels of government. Thus, cities are often compelled to focus data efforts on a limited number of policy areas and/or one-off projects because of the wide-ranging measurement agenda, which encompasses vastly different needs, and calls for a variety of skills, capacities and strategies.

Encouragingly, many surveyed cities report concerted efforts to break down siloes, which are common vestiges of traditional public sector organisations. Also encouraging, several cities report possessing "sufficient" data to advance innovation work in 19 sectors, mostly transport/mobility, land use/zoning, law enforcement, water and sanitation, and economic development. Use of data-driven decision making like in Syracuse, New York (United States) demonstrates the potential of data use by cities (Box 1.5).

Box 1.5. Leveraging data to inform budget decisions in Syracuse, NY, United States

Syracuse is one of the snowiest cities in the United States, receiving an average of over 100 inches of snow per year. The city turned to its data on salt purchasing and historical snowfall patterns to inform its budgeting and purchasing forecasts. By predicting salt usage and purchasing when the commodity is cheaper, the city was able to reduce its salt budget by over USD 800 000.

Source: Bloomberg Philanthropies (2020[14]), "What Works Cities (WWC) Certification (database)", Unpublished.

Towards a local government framework for data governance

A coherent data governance framework constitutes the first step in building a data-driven organisation: it can forge a strategic vision and facilitate municipalities' technical capacity to leverage data for residents' well-being. By considering every stage of the government data value cycle, from data collection and storage to data analysis and publication, a governance framework can facilitate data sharing within and beyond the organisation, minimise security and privacy risks, and maximise the public value derived from the use and re-use of data. Indeed, an effective framework not only focuses on technical aspects such as data interoperability and standards, but also creates an enabling environment for systematic use of data for problem solving and decision making.

At the national level, most OECD governments work to put in place a framework that maximises the potential of data (OECD, 2019[15]). Even though many OECD countries have implemented regulations, standards, and strategies for data management and digital governments, these frameworks tend to be

fragmented, as different public sector organisations are responsible for different aspects of data. Such fragmentation of internal organisation, and thus governance, impedes the public sector's ability to integrate and manage data.

Drawing on the OECD's considerable experience in digital government and government data, as well as extensive literature review on data governance, the OECD publication *The Path to Becoming a Data-Driven Public Sector* (2019[15]) proposes a common framework for public sector data governance to help standardise the concept and promote its implementation across countries. The national framework organises (non-exclusive) data governance elements into six groups under three layers:

1. **Strategic layer**, including (a) Leadership and vision
2. **Tactical layer**, including (b) Capacity for coherent implementation and (c) Legal and regulatory framework
3. **Delivery layer**, including (d) Integration of the data value cycle, (e) Data infrastructure and (f) Data architecture

While this framework was formulated for national government, it remains relevant for the sub-national level, where municipalities increasingly seek to develop a more comprehensive and coherent approach to data governance. This report proposes a tailored model for data governance in the local public sector. With a focus on the strategic and tactical layers, the tailored framework provides municipalities with a structured approach to target key data governance elements that simultaneously generate public value and transition toward a data-driven organisation.

An OECD methodology to assess the links between well-being, public sector innovation and data use at the local level

City governments aim to ensure residents' well-being through the policies they put in place, the services they provide, and the rules and norms they establish. Innovation and data are key tools that local governments can use to meet this objective and, as any tool, they need to be examined in relation to the objective they serve. This section studies the links between public sector innovation and data use by city governments (the tools) with respect to residents' well-being outcomes (the objective).

Assessing links between well-being, public sector innovation and data use in cities requires defining and measuring all three aspects. To do so, this report leverages the OECD regional and local well-being framework (OECD, 2014[16]; OECD, 2019[17]), the OECD/Bloomberg Survey on Innovation Capacity in Cities carried out in 2018 (OECD, 2019[1]) and 2020 (updated version for this report), and the What Works Cities Standard (Bloomberg Philanthropies, 2020[3]) – including its WWC Certification database 2018-20 (Bloomberg Philanthropies, 2020[14]). The OECD regional and local well-being framework guides the choice of well-being outcomes used in the analysis, while the Survey on Innovation Capacity in Cities and the What Works Cities Assessment framework provide, respectively, information on public sector innovation capacity and data use practices likely to affect residents' well-being.

Measuring well-being outcomes in cities

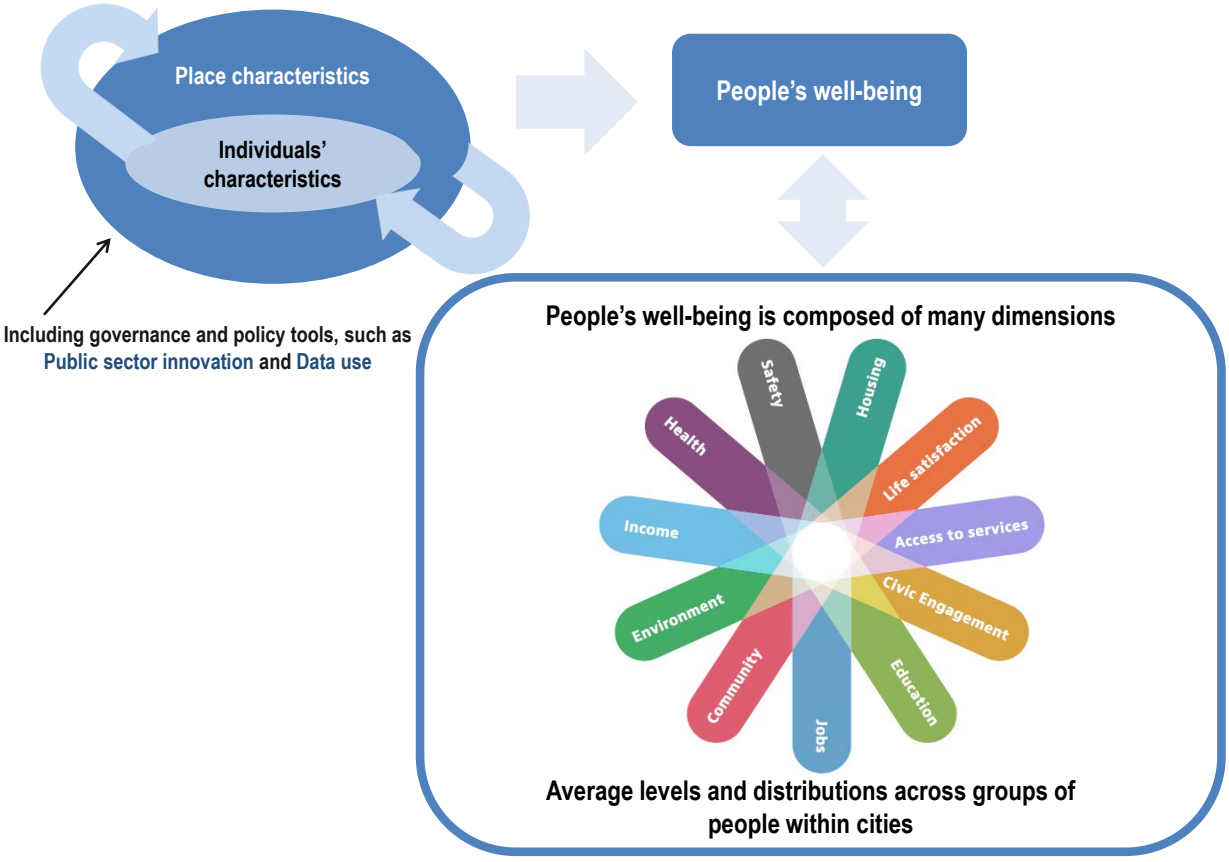
The OECD regional and local well-being framework facilitates a multi-dimensional view of how life is for people in the place they live (OECD, 2014[16]; OECD, 2019[17]). The framework identifies 11 dimensions to assess people's well-being outcomes: Jobs, Income, Housing, Access to services, Education, Civic engagement, Health, Environment, Safety, Community, and Life satisfaction. These include objective indicators (e.g. life expectancy) and subjective indicators (e.g. self-reported health) that contribute to an understanding of well-being that goes beyond material conditions. The original framework uses 13 baseline indicators for large OECD regions, but can be adapted to the specificities of any country, region or city, or

to different assessment frameworks. For example, this framework was used to assess well-being in Mexican states in 2015 (OECD, 2015[18]), in Danish cities in 2016 (OECD, 2016[19]), in urban agglomerations in Córdoba, Argentina in 2018 (OECD, 2019[17]), and more recently across local authorities in Wales, United Kingdom (OECD, 2020[20]).

Three features of the OECD regional and local well-being framework emerge as key to our analysis, notably that well-being is (1) multi-dimensional, (2) people-centred and (3) shaped by governance and policy tools such as public sector innovation and data use. Well-being indicators therefore focus on *outcomes* that directly reflect people's well-being (e.g. exposure to air pollution or having access to tertiary education) rather than on *inputs*, which tend to be the means to improve outcomes (e.g. investments in public transport or number of public universities).

Measuring well-being at the local level helps understand how local conditions and institutions, such as public sector innovation and data use, affect people's lives. The OECD regional and local well-being framework shows that well-being outcomes are not only the consequence of individual characteristics, but also of place-based characteristics, including local institutions, governance, and tools for policy making such as public sector innovation and data use (Figure 1.1).

Figure 1.1. Public sector innovation and data use through the lens of the OECD regional and local well-being framework



Source: Adapted from OECD (2019[17]), *How's Life in the Province of Córdoba, Argentina?*, OECD Publishing, Paris, https://doi.org/10.1787/97f189b1-en.

To measure well-being outcomes in cities for this report, the OECD collected 30 indicators across 11 well-being dimensions for 200 cities in the United States and 19 European countries. The main sources of well-being data for cities in the United States were the American Community Survey (ACS), the City Health Dashboard and Gallup US Daily, the Reflective Democracy Campaign, Who Votes for Mayor and Ballotpedia. For European cities, the main sources of data were Eurostat and the European Quality of Life Survey (EQLS) (see Box 1.6). While more than 100 indicators were reviewed, only the 30 most relevant indicators with good coverage across cities were retained for the final assessment (Table 1.1).

Due to the challenge of collecting comparable city-level data across countries, the quantitative analysis in this report relies on a sub-sample of the cities that participated in either the 2018 OECD/Bloomberg Survey on Innovation Capacity in Cities or in the What Works Cities Assessment framework, and for which it was possible to retrieve relevant well-being indicators. The sample was also restricted to cities in the United States and Europe because the low number of cities in Latin America, Asia, Africa and Oceania participating in the frameworks and with sufficient well-being data did not allow for a meaningful representation of these areas. Of note, while 112 cities come from the 2018 OECD/Bloomberg Survey on Innovation Capacity in Cities and 145 come from the What Works Cities Assessment framework, the final sample consists of 200 cities because 57 belong to both (Annex Table 1.B.1).

Box 1.6. Main sources for well-being indicators in United States and European cities

American Community Survey

The American Community Survey (ACS) publishes detailed information on the economic, housing and demographic characteristics of cities and regions in the United States. This source informs objective well-being indicators like the percentage of households living in affordable housing or the employment rate. For most indicators, the ACS provides comprehensive coverage across 163 American cities that participated in either the What Works Cities Assessment or the 2018 OECD/Bloomberg Survey on Innovation Capacity in Cities.

City Health Dashboard

The City Health Dashboard is an initiative of NYU Langone Health and NYU Wagner that provides information on health and health-related factors affecting quality of life in cities across the United States. It includes, for example, indicators on access to preventive services, walkability and air pollution. The number of cities represented in this source ranges from 103 to 155, depending on the indicator.

Eurostat

Eurostat's City statistics database contains objective well-being indicators on housing, health, labour markets, education, environment and transport in European cities. This source includes up to 52 cities participating in the 2018 OECD/Bloomberg Survey on Innovation Capacity in Cities or the What Works Cities Assessment.

European Quality of Life Survey

The European Quality of Life Survey (EQLS) provides information on people's perceptions of quality of life and city administration. Indicators include life satisfaction, city satisfaction and satisfaction with public transport. Only 26 cities that took part in the 2018 OECD/Bloomberg Survey on Innovation Capacity in Cities were represented in the latest edition of the EQLS.

Gallup U.S. Daily

Gallup US Daily tracks people's perceptions on economic and social issues at the local level. Individual-level data from Gallup US was aggregated at the city level using ZIP codes (more than 30 000 available) to create indicators on life satisfaction, city satisfaction, self-reported health and perceived material conditions for 160 US cities.

The Reflective Democracy Campaign

The Reflective Democracy Campaign publishes data on the demographics of candidates and elected officials in the United States. Their 2016-17 Demographics of Power Report gives information on gender and non-white representation gaps in the largest 200 US cities, of which 103 belong to either the What Works Cities Assessment or the 2018 OECD/Bloomberg Survey on Innovation Capacity in Cities.

Ballotpedia and Who Votes for Mayor

Information from Ballotpedia, a non-profit providing a digital encyclopaedia of American politics and elections, and from Who Votes for Mayor, a project by Portland State University studying voting at the local level, was used to create an indicator on voter turnout for mayoral elections in 71 US cities.

While all 30 indicators contribute to understanding various aspects of well-being, 13 headline indicators with the largest coverage were selected to provide an overview across well-being dimensions. In order to provide a first overview of how well-being outcomes differ across cities with different capacities for public sector innovation and data use, this report builds indexes by well-being dimension (from 0 to 100, see Annex 1.C). The report then explores the links between individual well-being indicators and different components of public sector innovation and the foundational areas of data use.

Table 1.1. Selected indicators to measure well-being in cities

Well-being dimension	Indicator name
Jobs	Employment rate[1]
	Unemployment rate[1]
	Job satisfaction
	Self-reported employment
Income	Income deviation from national average[1]
	Enough money for own needs
	Child poverty
	Income inequality
	Confidence in economic conditions
Housing	Affordability of housing[1]
Access to services	Walkability index[1]
	Public transport satisfaction
	Access to preventive services
	Access to prenatal care
	Limited access to healthy food
Education	Educational attainment[1]
	Reading proficiency
Civic engagement	Voter turnout[1]
	Women representation gap
	Non-white representation gap
Health	Life expectancy[1]
	Perceived health[1]
	Obesity rate
	Uninsured population
	Mental distress
Environment	Air pollution[1]
Personal safety	Crime rates[1]
	Traffic-related mortality rates
Community	City satisfaction[1]
Life satisfaction	Life satisfaction[1]

Note: 1. Headline indicator, used to build an index by well-being dimension.

The final database covers a wide and diverse sample in terms of population size of 200 cities across the United States and Europe (see full sample of cities in Annex Table 1.B.1). While the average population of the 161 US cities is around 400 000, the average population of the 39 EU cities is above 1 million. Both the US and EU samples have around 30% of cities with between 200 000 and 500 000 inhabitants. Nevertheless, while more than half of the US cities have below 200 000 inhabitants, more than half of the EU cities in the analysis have more than 500 000 people (Table 1.2).

Table 1.2. Sample of cities by population size

Population size (in thousands)	European Union (% of 39 cities)	United States (% of 161 cities)
Below 200	15	54
200-500	28	29
Above 500	56	17

Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities; Bloomberg Philanthropies (2020[14]), "What Works Cities (WWC) Certification (database)", Unpublished.

Assessing public sector innovation capacity

The assessment of public sector innovation capacity in cities relies on the joint 2018 OECD/Bloomberg Survey on Innovation Capacity in Cities. The survey investigated the main drivers and characteristics of public sector innovation capacity in cities across five components: Innovation strategy, Innovation staff, Funding for innovation, Data for innovation, and Innovation outcomes evaluation (Box 1.1). A selection of survey questions for each of the five was used to create a public sector innovation (PSI) score with total value from 0 to 10 (Table 1.3). Thus, the PSI score captures essential aspects of public sector innovation capacity in cities. Although 147 cities participated in the survey, only 112 (of which, 74 in the United States and 38 in Europe) responded to the questions for the PSI score and had sufficient data on relevant outcome indicators.

Table 1.3. Survey questions used to create the public sector innovation score

Innovation component	Survey questions: If answer is Yes, score 1 (2 for Funding), 0 otherwise
Innovation strategy (2)	Does your municipality have a formal innovation strategy?
	Does your municipality follow a holistic strategy for innovation?
Innovation staff (2)	Are there staff of the municipality (such as, but not limited to) designated team(s) and/or officer(s) working on innovation?
	Have your innovation teams existed for 5 years or more?
Funding for innovation (1)	Is there specific funding available at the municipality to support innovation capacity?
Data for innovation (2)	Do data play a significant role in your city's innovation efforts and decision making?
	Has your municipality developed any partnerships with the aim of collecting or analysing data to fuel innovation capacity or strategy?
Innovation outcomes evaluation (2)	Does your municipality undertake a systematic and comprehensive assessment or evaluation of the impact of your innovation strategy and your innovation programme outcomes?
	Does your city have formal innovation goals?

Note: Number of survey questions in parentheses.
Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

Assessing data use in cities

The measurement in this report of data use in city management and policy making relies on the What Works Cities Certification, a standard of excellence for well-managed, data-driven local government. The WWC Standard identifies 45 criteria of data use distributed across eight foundational areas: Data Governance, Evaluations, General Management, Open Data, Performance and Analytics, Repurposing, Results-Driven Contracting, and Stakeholder Engagement (see Box 1.2). The criteria are used to create a score from 0 to 45, where each point represents a data use practice implemented by the city administration and validated by a team of experts (see full list of practices in Annex Table 1.B.1). Overall, the score reflects cities' commitment to using data for administration, policy design and evaluation. In total, the analysis covers 145 cities (141 in the United States, 4 in Europe) that participated in the WWC programme and for which there is sufficient information on well-being outcomes.

Methodological considerations and caveats

The analysis in this report (Chapters 2 and 3) brings novel and internationally comparable evidence on well-being outcomes for cities with various degrees of public sector innovation capacity and data use. However, for reasons explained below, the evidence should be neither interpreted as causal nor generalised to cities outside the sample – particularly to cities outside the United States and Europe.

First, the current assessment is limited to cities that took part in either the 2018 OECD/Bloomberg Survey on Innovation Capacity in Cities or in the What Works Cities Assessment. Further, due to the challenge of finding internationally comparable data on well-being outcomes at the city level, the sample is restricted to cities in the United States and Europe. As such, the sample used for quantitative analysis represents only a fraction of the universe of cities that might be pursuing innovation and data use activities worldwide.

Second, the self-selection of cities into the 2018 OECD/Bloomberg Survey on Innovation Capacity in Cities and the What Works Cities Assessment makes it difficult to draw causal conclusions about the effects of city innovation and data use on resident well-being. In an ideal setting, the cities would be drawn from a random sample representative of all types of cities in the countries of interest. In this case, the analysis is limited to cities that volunteered to participate in one or both of the programmes and engaged in the data collection process. Relative to non-participating cities, cities that responded to the 2018 OECD/Bloomberg Survey on Innovation Capacity may be more advanced or inclined to showcase high levels of commitment to innovation. Similarly, cities that undertook the What Works Cities Assessment are likely advanced or highly committed to data use and may be incentivised by the prospect of dedicated training and expertise.

As with any empirical exercise, the effect of public sector innovation and data use on well-being can be difficult to assess as there are often many factors and policies that simultaneously affect a particular outcome. Although the present analysis corrects for the effect of city size (taken as the population of the city) and economic development (measured as the percentage difference between the average city and national household income), there might be other factors that remain unobserved.

Lastly, the analysis does not capture virtuous effects of public sector innovation and data use that may manifest in the very long term or via indirect channels. In particular, public sector innovation and data use scores only cover one or two years, which limits the potential to exploit the time dimension at this stage.

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Annex 1.A. Participants in the 2020 OECD/Bloomberg Survey on Innovation Capacity in Cities

Annex Table 1.A.1. Participants in the 2020 OECD/Bloomberg Survey on Innovation Capacity in Cities

City	Country
Adelaide	Australia
Akron, OH	United States
Alexandria, VA	United States
Amsterdam	The Netherlands
Anchorage, AK	United States
Athens	Greece
Atlanta, GA	United States
Aurora, IL	United States
Austin, TX	United States
Baltimore, MD	United States
Barcelona	Spain
Beer Sheva	Israel
Bend, OR	United States
Bilbao	Spain
Bloomington, IN	United States
Bologna	Italy
Boulder, CO	United States
Braga	Portugal
Bratislava	Slovak Republic
Bristol	United Kingdom
Brussels	Belgium
Buenos Aires	Argentina
Busan	Korea
Cape Town	South Africa
Charlotte, NC	United States
Chattanooga, TN	United States
Chelsea, MA	United States
Chicago, IL	United States
Cincinnati, OH	United States
Curitiba	Brazil
Curridabat	Costa Rica
Dallas, TX	United States
Denver, CO	United States
Detroit, MI	United States
Dublin	Ireland
Durham, NC	United States
Edmonton	Canada
El Paso, TX	United States
Enschede	Netherlands
Fort Collins, CO	United States
Fort Lauderdale, FL	United States
Fortaleza	Brazil

Georgetown, TX	United States
Glendale, CA	United States
Godoy Cruz	Argentina
Gothenburg	Sweden
Granada	Spain
Grand Rapids, MI	United States
Helsinki	Finland
Hillsboro, OR	United States
Houston, TX	United States
Huntington, WV	United States
Incheon	Korea
Indianapolis, IN	United States
Inverness	United Kingdom
Irving, TX	United States
Jersey City, NJ	United States
Jerusalem	Israel
Kansas City, KS	United States
Lansing, MI	United States
Leipzig	Germany
Lexington, KY	United States
Lima	Peru
Lisbon	Portugal
Little Rock, AR	United States
Liverpool City Region	United Kingdom
Ljubljana	Slovenia
London	United Kingdom
Long Beach, CA	United States
Los Angeles, CA	United States
Louisville, KY	United States
Maceio	Brazil
Madrid	Spain
Manteca, CA	United States
Maribor	Slovenia
Medellin	Colombia
Memphis, TN	United States
Mexico City	Mexico
Miami, FL	United States
Milan	Italy
Minneapolis, MN	United States
Mobile, AL	United States
Montgomery, AL	United States
Montreal	Canada
Moscow	Russia
New York City, NY	United States
Oakland, CA	United States
Oklahoma City, OK	United States
Orlando, FL	United States
Otsu	Japan
Oulu	Finland
Palermo	Italy
Paris	France
Paterson, NJ	United States
Pelotas	Brazil

Peoria, IL	United States
Philadelphia, PA	United States
Pittsburgh, PA	United States
Portland, ME	United States
Providence, RI	United States
Quillota	Chile
Reykjavik	Iceland
Rio de Janeiro	Brazil
Riverside, CA	United States
Rochester, NY	United States
Rome	Italy
Rosario	Argentina
Rotterdam	Netherlands
Saint Paul, MN	United States
Saltillo	Mexico
San Diego, CA	United States
San Francisco, CA	United States
San Jose, CA	United States
San Pedro Garza Garcia	Mexico
Santiago de Chile	Chile
Sao Paulo	Brazil
Scottsdale, AZ	United States
Seattle, WA	United States
Seoul	Korea
Sintra	Portugal
Sioux Falls, SD	United States
Sofia	Bulgaria
South Bend, IN	United States
Stockholm	Sweden
Syracuse, NY	United States
Tacoma, WA	United States
Tallahassee, FL	United States
Tel Aviv	Israel
Tokyo	Japan
Toronto	Canada
Toyama	Japan
Tulsa, OK	United States
Turin	Italy
Umea	Sweden
Utrecht	Netherlands
Verona	Italy
Vienna	Austria
Vilnius	Lithuania
Virginia Beach, VA	United States
Walnut Creek, CA	United States
Wellington	New Zealand
West Hollywood, CA	United States
Westminster, CO	United States
Wichita, KS	United States
Winnipeg	Canada
Winston-Salem, NC	United States
Worcester, MA	United States

Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

Annex 1.B. Cities in the quantitative analysis

Annex Table 1.B.1. Cities included in the quantitative analysis

Country	City	OECD/Bloomberg Survey, 2018-20	What Works Cities Assessment, 2018-20
Austria	Vienna	X	
Belgium	Brussels	X	
Bulgaria	Sofia	X	
Finland	Helsinki	X	X
Finland	Oulu	X	
France	Paris	X	
Germany	Leipzig	X	
Greece	Athens	X	
Iceland	Reykjavik	X	X
Ireland	Dublin	X	
Italy	Bologna	X	
Italy	Palermo	X	
Italy	Rome	X	
Italy	Turin	X	
Italy	Verona	X	
Lithuania	Vilnius	X	
Netherlands	Amsterdam	X	
Netherlands	Enschede	X	
Netherlands	Rotterdam	X	
Netherlands	Utrecht	X	
Portugal	Braga	X	
Portugal	Lisbon	X	
Portugal	Sintra	X	
Russia	Moscow	X	
Slovakia	Bratislava	X	X
Slovenia	Ljubljana	X	
Slovenia	Maribor	X	
Spain	Barcelona	X	
Spain	Bilbao	X	
Spain	Granada	X	
Spain	Madrid	X	
Sweden	Gothenburg	X	
Sweden	Stockholm	X	
Sweden	Umea	X	
United Kingdom	Birmingham		X
United Kingdom	Bristol	X	
United Kingdom	Inverness	X	
United Kingdom	Liverpool	X	
United Kingdom	London	X	
United States	Akron, OH	X	
United States	Albany, NY		X
United States	Albuquerque, NM		X
United States	Alexandria, VA	X	
United States	Anchorage, AK	X	X

United States	Arlington, TX		X
United States	Asheville, NC		X
United States	Athens, GA		X
United States	Atlanta, GA	X	X
United States	Aurora, IL	X	X
United States	Austin, TX	X	X
United States	Baltimore, MD	X	X
United States	Baton Rouge, LA		X
United States	Bellevue, WA		X
United States	Bend, OR	X	
United States	Bethlehem, PA		X
United States	Birmingham, AL		X
United States	Bloomington, IN	X	X
United States	Boston, MA		X
United States	Boulder, CO	X	X
United States	Buffalo, NY		X
United States	Cambridge, MA		X
United States	Cape Coral, FL		X
United States	Cary, NC		X
United States	Chamblee, GA		X
United States	Chapel Hill, NC		X
United States	Charleston, SC		X
United States	Charleston, WV		X
United States	Charlotte, NC	X	X
United States	Chattanooga, TN	X	X
United States	Chelsea, MA	X	X
United States	Cheyenne, WY		X
United States	Chicago, IL	X	
United States	Chula Vista, CA		X
United States	Cincinnati, OH	X	X
United States	Columbus, GA		X
United States	Columbus, OH		X
United States	Corona, CA		X
United States	Dallas, TX	X	X
United States	Dayton, OH		X
United States	Denver, CO	X	X
United States	Detroit, MI	X	X
United States	Downey, CA		X
United States	Durham, NC	X	X
United States	El Paso, TX	X	X
United States	Evanston, IL		X
United States	Fayetteville, NC		X
United States	Fort Collins, CO	X	X
United States	Fort Lauderdale, FL	X	X
United States	Fort Worth, TX		X
United States	Gainesville, FL		X
United States	Georgetown, TX	X	
United States	Gilbert, AZ		X
United States	Gilroy, CA		X
United States	Glendale, AZ		X
United States	Glendale, CA	X	
United States	Grand Rapids, MI	X	
United States	Great Falls, MT		X

United States	Greensboro, NC		X
United States	Gresham, OR		X
United States	Hartford, CT		X
United States	Hillsboro, OR	X	
United States	Holyoke, MA		X
United States	Honolulu, HI		X
United States	Houston, TX	X	X
United States	Huntington, WV	X	X
United States	Independence, MO		X
United States	Indianapolis, IN	X	X
United States	Irving, TX	X	X
United States	Jackson, MS		X
United States	Jersey City, NJ	X	X
United States	Johnson City, TN		X
United States	Kalamazoo, MI		X
United States	Kansas City, KS	X	
United States	Kansas City, MO		X
United States	Kent, WA		X
United States	La Crosse, WI		X
United States	Lancaster, PA		X
United States	Lansing, MI	X	X
United States	Laredo, TX		X
United States	Lexington, KY	X	
United States	Lincoln, NE		X
United States	Little Rock, AR	X	X
United States	Long Beach, CA	X	X
United States	Longmont, CO		X
United States	Los Angeles, CA	X	X
United States	Louisville, KY	X	X
United States	Madison, WI		X
United States	Manchester, NH		X
United States	Manteca, CA	X	
United States	Memphis, TN	X	X
United States	Mesa, AZ		X
United States	Miami, FL	X	X
United States	Minneapolis, MN	X	X
United States	Mobile, AL	X	
United States	Montgomery, AL	X	X
United States	Moorhead, MN		X
United States	Naperville, IL		X
United States	New Haven, CT		X
United States	New Orleans, LA		X
United States	New York, NY	X	
United States	Newark, NJ		X
United States	Norfolk, VA		X
United States	Oakland, CA	X	
United States	Oklahoma City, OK	X	X
United States	Olathe, KS		X
United States	Palmdale, CA		X
United States	Parkland, FL		X
United States	Paterson, NJ	X	X
United States	Peoria, IL	X	
United States	Philadelphia, PA	X	X

United States	Phoenix, AZ		X
United States	Pittsburgh, PA	X	X
United States	Portland, ME	X	X
United States	Portland, OR		X
United States	Providence, RI	X	X
United States	Pueblo, CO		X
United States	Racine, WI		X
United States	Rancho Cucamonga, CA		X
United States	Reno, NV		X
United States	Riverside, CA	X	
United States	Rochester, MN		X
United States	Rochester, NY	X	X
United States	Rocky Mount, NC		X
United States	Roswell, GA		X
United States	Saint Paul, MN	X	X
United States	Salinas, CA		X
United States	San Antonio, TX		X
United States	San Diego, CA	X	X
United States	San Francisco, CA	X	X
United States	San Jose, CA	X	X
United States	Santa Fe, NM		X
United States	Santa Monica, CA		X
United States	Scottsdale, AZ	X	X
United States	Seattle, WA	X	X
United States	Shreveport, LA		X
United States	Sioux Falls, SD	X	X
United States	Somerville, MA		X
United States	South Bend, IN	X	X
United States	St. Louis, MO		X
United States	St. Petersburg, FL		X
United States	Syracuse, NY	X	X
United States	Tacoma, WA	X	X
United States	Tallahassee, FL	X	
United States	Tempe, AZ		X
United States	Thousand Oaks, CA		X
United States	Toledo, OH		X
United States	Topeka, KS		X
United States	Trenton, NJ		X
United States	Tulsa, OK	X	X
United States	Vancouver, WA		X
United States	Victorville, CA		X
United States	Virginia Beach, VA	X	X
United States	Walnut Creek, CA	X	X
United States	Washington, DC		X
United States	West Hollywood, CA	X	
United States	Westminster, CO	X	
United States	Wheaton, IL		X
United States	Wichita, KS	X	X
United States	Winston-Salem, NC	X	
United States	Worcester, MA	X	X

Note: Empty cells indicate that the city did not participate in the programme.
Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities; and WWC Certification database, 2018-20.

Annex 1.C. Computing normalised indexes for each dimension of well-being

Well-being indicators use different units depending on the aspect they measure. For example, household income is typically expressed in USD PPP (US dollars using purchasing power parity), whereas life expectancy and representation of women in local government are expressed in years and as a percentage, respectively. To compare and aggregate well-being indicators using the same scale, the OECD well-being framework normalises them using the min-max method (OECD, 2019[21]). This statistical formula transforms the value of the indicator into a score from 0 to 100, where 100 is the highest score possible for a normalised indicator.

To transform the value of an indicator into a well-being score (0-100) three steps must be taken:

1. Identify the city minimum and the city maximum values for each well-being indicator.
2. Normalise the indicators by applying the min-max formula (see below).
3. Calculate the mean of the normalised indicators within the same well-being dimension.

Formula $\hat{x}_i$ is used for indicators with a positive sense (e.g. employment, life satisfaction) and formula $\check{x}_i$ for indicators with a negative sense (e.g. unemployment, air pollution).

$$\hat{x}_i = 100 * \left(\frac{x_i - \min(x)}{\max(x) - \min(x)}\right) \qquad \check{x}_i = 100 * \left(\frac{\max(x) - x_i}{\max(x) - \min(x)}\right)$$

Finally, based on the third step, when a well-being dimension is measured by more than one indicator (e.g. “Jobs”, which comprises employment and unemployment rates, or “Health”, which combines life expectancy and perceived health), the score of the well-being dimension is defined by the simple mean of the normalised indicators in the same dimension.

2 Innovation as a feature of policy making in cities

The chapter explores how local public sector innovation can improve residents' well-being, based on responses from 147 cities to the OECD/Bloomberg Survey on Innovation Capacity in Cities (2018-20) and a review of literature addressing public sector innovation capacity. The first section reviews the types and levels of impact that public sector innovation can have on residents and city operations. The chapter then delves into findings from the survey and assesses the role that five innovation components play in enhancing city governments' innovation capacity. The chapter concludes with an analysis of how the survey findings compare to well-being indicators.

How local public sector innovation improves residents' well-being

In 2018, the OECD and Bloomberg Philanthropies joined forces to assess how cities around the world build their capacity to innovate. To execute this work, the OECD/Bloomberg team administered the Survey on Innovation Capacity in Cities to over one hundred cities worldwide. The goal was to glean a deeper understanding of how innovation capacity can lead to improved well-being outcomes for residents. The hope is that cities can benefit from the trends, common challenges and best practices identified in the survey responses to improve the impact of their investment in innovation.

As explored later in this chapter, results from the OECD/Bloomberg Survey show that public sector innovation helps cities improve service delivery and resident outcomes, cut costs and streamline internal operations, plan for future challenges, generate new revenue streams, and more. Each of these values generated by public sector innovation can lead to tangible improvements in residents' well-being—a unique aspect of innovation in the public sector.

While the value generated by innovation in the private sector is predominantly profit, public sector innovation is distinct in its motives to find new ways to improve society, government itself, and the relationship between government and the public (Janssen et al., 2017[1]). Compared to the private sector, policy interest in public sector innovation concerns "how innovation occurs in order to increase its use to solve problems and improve outcomes" including for residents (Arundel, Bloch and Ferguson, 2019[2]). Public sector managers have expressed that "innovation must make something better or have a goal to deliver better outputs".

Indeed, innovation in the public sector aims to produce outputs valued by the residents it serves. According to Thenint (2010[3]), "the key things which citizens value tend to fall into three categories: outcomes, services and trust". The report *Powering European Public Sector Innovation* (European Commission, 2013[4]) similarly identified at least four kinds of value generated by innovation activity:

- **Outcomes:** Better achievement of individual and societal outcomes such as increased health, employment, security, and sustainable environment.
- **Services:** Providing residents and businesses with more meaningful, attractive and useful services, personalised and tailor-made for end-users whenever possible.
- **Productivity:** Enhancing the internal efficiency of public sector organisation management.
- **Democracy:** Strengthening citizen engagement and participation; ensuring accountability, transparency, and equality in society.

This chapter pays particular attention to three specific values generated by cities' innovation activity: (1) enhanced internal efficiency of government, (2) improved service delivery and (3) increased civic engagement. By leveraging innovation to generate these values and others, cities can better tackle societal challenges and improve residents' well-being. Based on surveyed city responses, Box 2.1 contains brief examples of public sector innovations, their outcomes and the types of value they create for residents.

Box 2.1. Survey chronicles: Outcomes and values of public sector innovation

Enhanced internal efficiency in Gothenburg, Sweden (population 592 000)

Innovation: Gothenburg established Fossil-Free Energy Districts (FED), aiming to reduce the city's energy consumption and dependence on fossil fuels by leveraging sustainable technologies such as photovoltaics, heat pumps and wind energy.

Outcome: The city's FEDs built a unique local market for sustainably sourced electricity, heating and cooling. With a EUR 5.8 million budget, FEDs served about 15 000 end-users during the pilot phase.

Improved service delivery in Huntington, WV, United States (population 47 079)

Innovation: Huntington uses innovation to fight its opioid epidemic. Its Compass wellness programme aims to prevent compassion fatigue among first responders, while the Drug Market Intervention (DMI) programme focuses on targeted interventions and addict rehabilitation instead of jail time. Huntington also leverages partnerships with the private sector and academia for funding and data analysis.

Outcome: Huntington reports that these innovations improved resident health as well as its delivery of emergency services. The Compass programme fortified first responders' ability to serve those who need them most, while the DMI programme and data analysis with Marshall University helped Huntington anticipate and manage future challenges around the epidemic.

Increased civic engagement in Rome, Italy (population 2 879 728)

Innovation: #RomaDecide is Rome's first participatory budgeting process where residents and city users can influence how EUR 20 million of the city budget are spent. Individual residents and local municipalities within the capital were encouraged to submit project proposals.

Outcome: The initiative received an overwhelming response from residents, with 193 submissions and participation by almost 24 000 voters. Proposals called for increased green space, creation of bike lanes, expanded pedestrian zones, children's playgrounds and fitness trails.

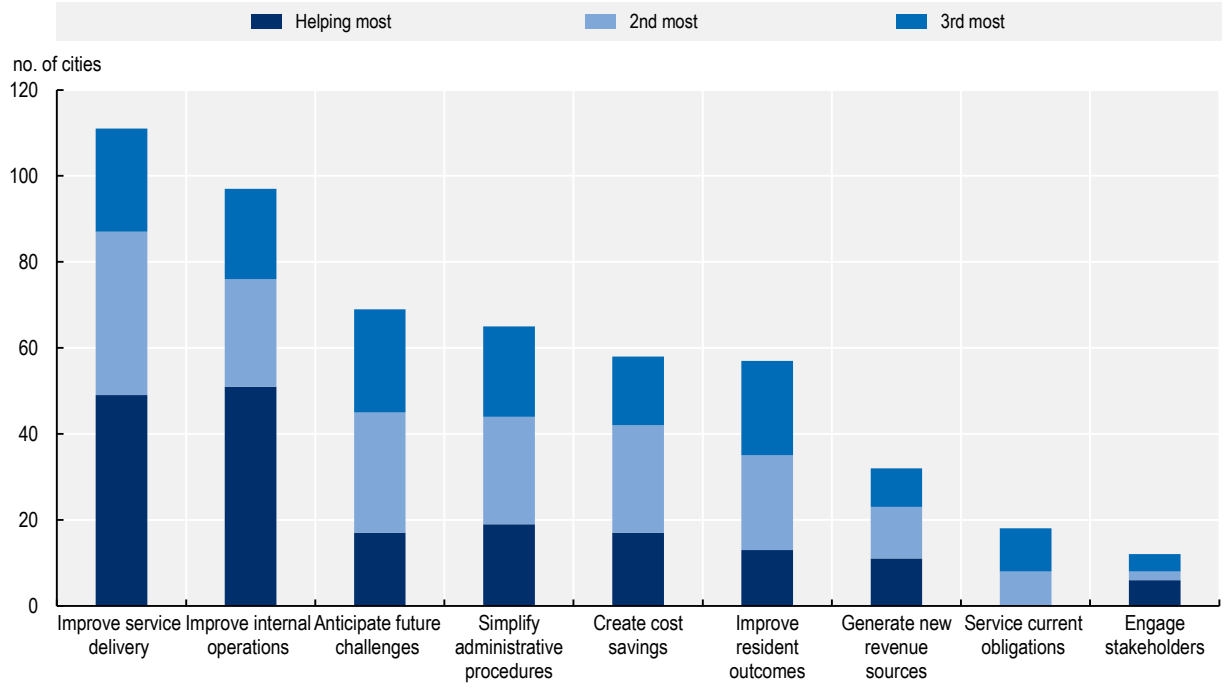
Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

Public sector innovation and its impacts take many forms

The results from the OECD/Bloomberg Survey demonstrate that innovation can take many forms and is often context-specific. The term "innovation" does not necessarily imply complex, expensive or futuristic cutting-edge technology. Local public sector innovation can also build a culture of innovation among staff, directly engage residents, build community partnerships, streamline internal workflows, and simplify service delivery (Figure 2.1).

While no official classification of public sector innovation types exists, some basic typologies emerge from research. For instance, the 2019 Co-VAL survey, composed of responses from national and municipal governments in six European countries, split innovation types into two broad categories: service and process (Arundel and Es-Sadki, 2019[5]). As reflected in Figure 2.1, innovation helps cities most to improve service delivery and internal government operations (e.g. processes).

Figure 2.1. Innovation most helps cities improve service delivery and internal efficiency



Note: Chart represents 141 cities' responses to Survey Question 5.4, "What is innovation helping your city do better?" Cities were allowed to provide three ranked choices.
Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

This trend is also reflected in many surveyed cities' innovation examples. Box 2.2 provides examples of a process innovation from Hillsboro, Oregon (United States) and a service innovation from Granada (Spain). Hillsboro's example focuses on internal processes while Granada's focuses on service delivery, but both lead to better well-being outcomes for residents. In Hillsboro, innovation both generates budgetary savings and trains staff in innovative thinking. The latter of these may lead to more innovation across city government in the future: Salge and Vera (2012[6]) identified a strong correlation between pervasive innovative approaches across public sector organisations and better outcomes for end-users (e.g. residents), suggesting that initiatives like Hillsboro's Eureka Challenge may translate to tangible improvements in residents' lives. Likewise, Granada leverages innovation and technology to expand accessibility to residents and visitors alike, regardless of mobility-related challenges. This is a major step toward making the city more inclusive and egalitarian.

Box 2.2. Survey anecdotes: How process and service innovations benefit residents

Hillsboro, OR, United States, enhances staff capacity to innovate through the Eureka Challenge

Hillsboro demonstrates how municipal government can overcome challenges through process innovation. In a city with only 103 000 residents and under 800 staff, the city had to get creative. The Office of Innovation compensates for its small team and limited funding resources using "Eureka!" improvement teams and the annual Eureka Challenge. The latter engages various departments through policy deep-dives and short-term innovation projects. Staff from multiple city agencies take a 30-day leave from their usual posts to form a team that focuses on a specific issue identified by the City Manager. The 2019 Challenge team tackled access to services and removed language or digital barriers, while another year's "Eureka!" improvement team convened to reduce the city's water consumption, ultimately lowering Hillsboro's water expenses by USD 70 000. This approach has the dual effect of generating an innovation staff within the city's existing budget and training all staff members to think more innovatively within their existing posts.

Granada, Spain, builds innovative services to increase accessibility to cultural landmarks

Granada uses Geographic Information System (GIS) technology to improve access for individuals with reduced mobility to two of its UNESCO World Heritage sites–Albaicín and Sacromonte–main attractions in the city and an important part of its cultural identity. Based on their mobility profile, users receive 3D visualisation with the optimal routes and detailed topographic information about stairs, slopes and pavements. The app is one of the first initiatives undertaken within the framework of Granada Human Smart City, which aims to build a more liveable and sustainable city using innovative technologies.

Source: OECD/Bloomberg (2018-20), Philanthropies Survey on Innovation Capacity in Cities.

Types of public sector innovation identified in the literature

The above-mentioned innovation outcomes appear consistent with research findings. In their study of public sector innovation in over three-thousand European government agencies, Arundel, Casali and Hollanders (2015[7]) found highly positive reporting on outcomes stemming from both process and service innovation, with some distinctions. Process innovations simplified administrative procedures, reduced costs for providing services, enabled faster delivery of services, and improved employee satisfaction and/or working conditions. Meanwhile, service innovations expanded access to more and different users, improved the targeting of services to relevant users, increased user satisfaction and access to information, and improved service delivery.

Another study analyses nearly 5 000 public sector innovation efforts in Mexico (Díaz Aldret, 2016[8]) and identifies four types of innovation–functional, structural, behavioural and relational (Box 2.3)–concluding that "the permanence and capacity to solidify [local level public sector innovations] lies in the depth of the transformations". Thus, changes induced by functional innovation are often more easily reversible than those executed at the behavioural and relational levels. These latter two innovation types tend to be the most stable and sustainable due to their focus on deeper changes to networks and mind-sets that alter fundamental relationships between stakeholders. In contrast, when a functional innovation merely changes the administrative process, it can easily be reversed during the next cycles of government.

Box 2.3. Four types of public sector innovation identified in research literature

Functional innovations: Actions that governments can take to increase their operational and economic efficiency, producing mechanisms that ensure greater effectiveness in administrative management. Often easiest to reverse.

Structural innovations: Legal or organisational reforms that seek a greater decentralisation of decision-making processes (e.g. empowering city staff to solve problems, co-creation with residents).

Behavioural innovations: Changes in attitudes and negotiation styles, aimed at resolving conflicts between government and citizens. More difficult to reverse.

Relational innovations: Changes to a municipal administration's networks, forms and/or mechanisms of interactions with their environments and with other levels of government. More difficult to reverse.

Source: Díaz Aldret (2016[8]), "Innovación desde los gobiernos locales mexicanos", in Cejudo, G., M. Dussauge Laguna and C. Michel (eds.), *La Innovación en el Sector Público: Tendencias internacionales y experiencias mexicanas*, Delegación Cuajimalpa, Mexico.

Indeed, some innovations assessed in the Mexico study operated for only two years and then "vanished", due in part to electoral turnover in the local administration. However, in cases where residents felt strongly they had benefited from an innovation, they successfully lobbied incoming mayors to leave it intact. This finding suggests that increased resident engagement and feedback can lead to higher retention of innovation activity. Other research suggests that involving residents in the innovation process can improve an innovation's fit with user needs, improve its quality and reduce its risk of failure (Arundel and Es-Sadki, 2019[5]), and that soliciting resident feedback can prompt a more accurate reflection of resident priorities in cities' budget and policy decisions (Kleiman and Goldsmith, 2018[9]). Thus, one way to address the challenge of short-lived innovation projects may be to conduct smaller evaluations throughout the process that focus on design, implementation, outcomes and impact, and include residents' feedback. The section "Evaluating outcomes can create feedback loops that lead to greater impact" discusses in detail cities' capacity to evaluate innovation outcomes.

Impacts of public sector innovation

Díaz Aldret (2016[8]) also examines a typology of nine categories of innovation in local government, originally developed by García (2014[10]), which focuses on the levels and nature of impact (Table 2.1). From this perspective, the level of an innovation can be basic, operational or transformative, and can have differing impacts depending on its focus and the environment in which it occurs.

Thus, an innovation is transformative if it impacts the quality of life of the target population, if it reconfigures governmental organisation or if it develops social capital among vulnerable groups (e.g. if networks of trust and collaboration emerge). By contrast, an innovation is basic if it produces temporary benefits on the target population, if it does not reconfigure governmental organisation or if resident engagement only occurs at the point of the implementation rather than in development and ideation (Díaz Aldret, 2016[8]).

Table 2.1. Levels and nature of public sector innovation impact

	Quality of life	Organisational impact	Impact on social networks
Basic	Ill-defined target populations reaping few, temporary benefits	Municipal government organisation does not change	Citizen's involvement occurs only during the implementation of programmes
Operative	Well-defined target populations and far-reaching results	Changes in the organisations' shape with visible improvement in operation	Relations between government and citizens are positively modified
Transformative	Positive impact on target populations	Organisational reconfiguration to assimilate innovation	Building of social capital

Source: Díaz Aldret (2016[8]), "Innovación desde los gobiernos locales mexicanos", in Cejudo, G., M. Dussauge Laguna and C. Michel (eds.), *La Innovación en el Sector Público: Tendencias internacionales y experiencias mexicanas*, Delegación Cuajimalpa, Mexico.

Cities' ability to implement transformative public sector innovation, whether by enhancing internal processes or improving service delivery, largely hinges on their innovation capacity. The OECD/Bloomberg Survey assesses cities' innovation capacity based on five main components. This chapter argues that the more cities develop their innovation capacity through these five components, the more transformative their innovation activity will be, leading to a greater impact on residents' lives, and improving their well-being.

Contextualising the OECD/Bloomberg Survey results

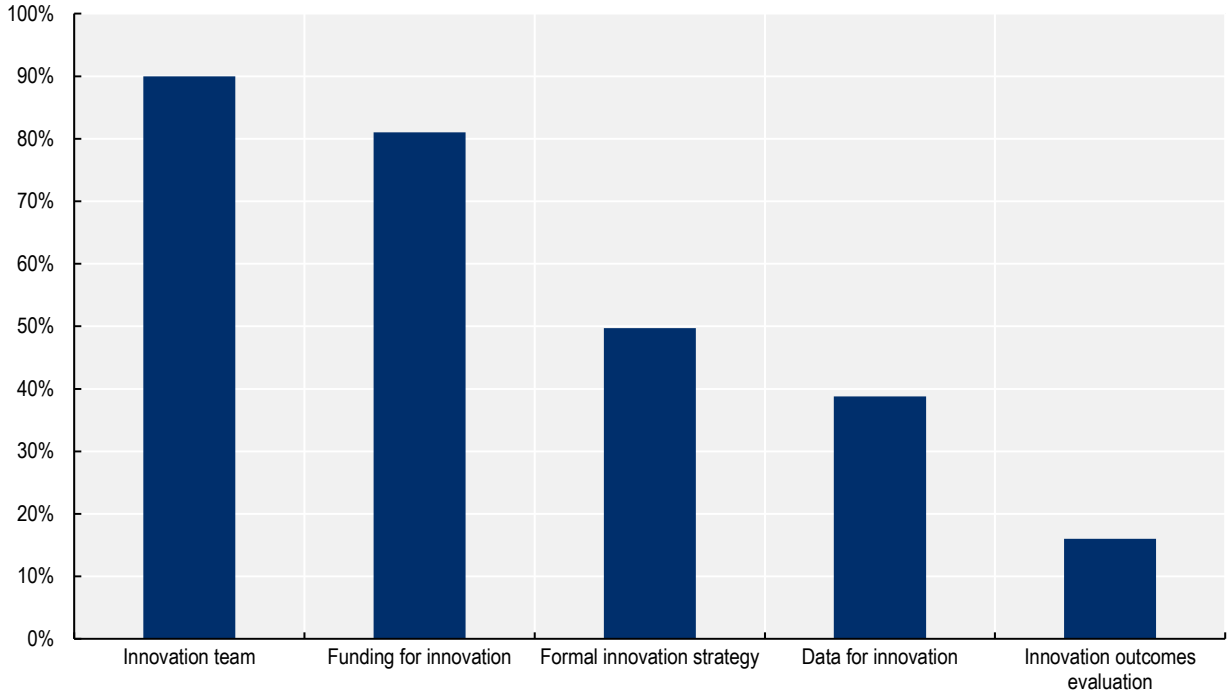
The OECD/Bloomberg Survey captured five components of innovation capacity in cities: (1) a formal strategy and approach, (2) staffing and organisational structure, (3) dedicated funding, (4) data use to support innovation and (5) evaluating innovation outcomes relative to stated objectives. Using these five components of public sector innovation to assess a city's innovation capacity is supported by research literature and discussion with experts, further detailed in the section "The five components of cities' innovation capacity". The survey also collected insights on factors of innovation capacity that do not fit into any one component, such as a culture of innovation or leadership of public sector organisations.

Embracing these components allows cities to transcend the traditional siloes of departments, build a cohesive and aligned strategy that fosters a culture of collaboration and leverage the potential of data to generate fact-based decision making. Developing these tenets of innovation capacity also allows cities to identify and guide resources toward programmes that have a bigger impact on residents' well-being and to constantly improve implementation through programme and policy evaluation.

The OECD/Bloomberg Survey provides high-level insights into cities' progress in developing the five components. As shown in Figure 2.2, a dedicated innovation staff and funding for innovation are most prominent in surveyed cities. The other three components–a formal innovation strategy, using data for innovation, and evaluating innovation outcomes–are noticeably less common among surveyed cities. Evaluating innovation outcomes lags particularly far behind the other components despite its potential to increase the impact of innovation by empowering cities to refine implementation through data-driven decision making. Reasons for this disparity, as well as why cities should focus on increasing their capacity in this area, are addressed later in the chapter.

Before analysing the survey results for each individual innovation component, it is worth examining the factors of innovation capacity that can apply to all five.

Figure 2.2. Most cities have staff and funding for innovation, but lack the other components



Note: Chart represents cities' responses to Survey Questions 1.2; 2.1; 3.1; 4.1; and 5.6 respectively.
Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

Cross-cutting "meta-capacities" for innovation: Culture and leadership

Assessing the innovation capacity of cities through the five components is a practical way to distinguish and compare cities' activities, priorities and needs. However, some crosscutting factors do not fit neatly into any single component. Concerns like culture and leadership around innovation can be considered "meta-capacities" equally applicable to each of the five components–perhaps even tying them together–helping cities to holistically develop and reinforce each one.

By emphasising these crosscutting meta-capacities, cities could better build capacity across all five components at once rather than individually. Approaching innovation in this way could overcome the tendency for siloed thinking in the public sector. It could also induce a virtuous cycle that increases the durability of cities' innovation capacity in the long term–important in the wake of crises like COVID-19 that challenge cities' priorities.

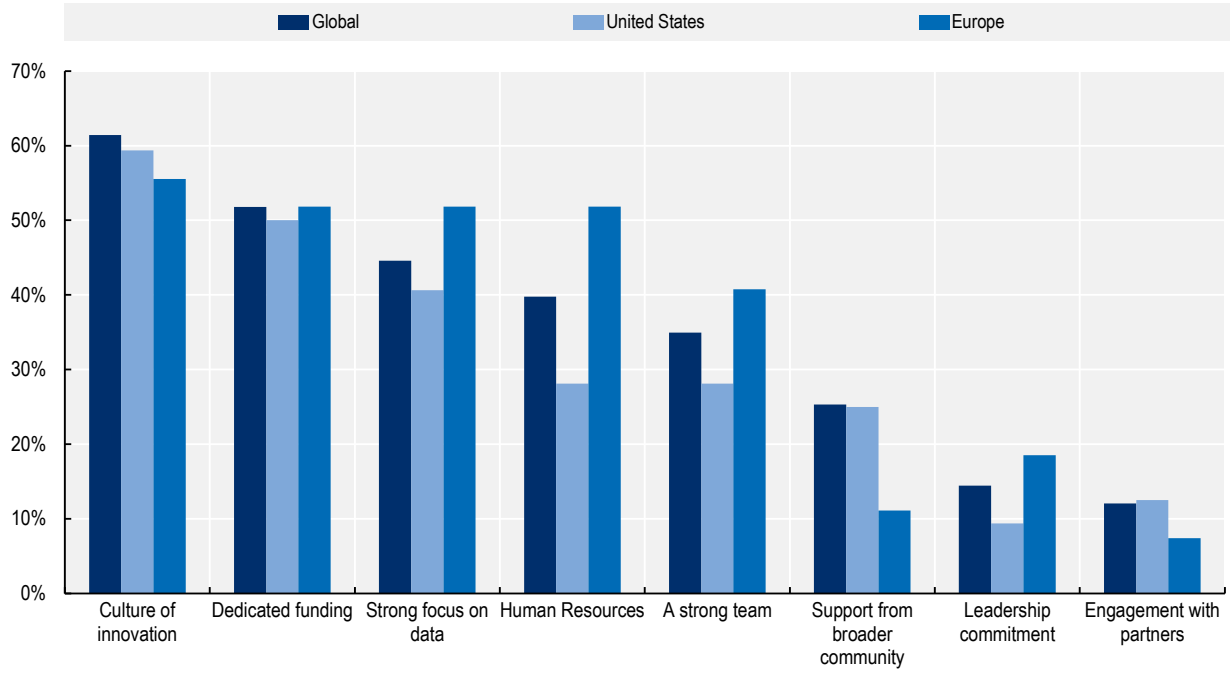
A robust innovation culture can bolster all five components, deepening their impact

According to Bason (2018[11]), innovation culture can be defined as "a culture where a group of people's shared values, customs and assumptions are conducive to new ideas and organisational change". Engraining a culture of innovation within a city administration could bolster its capacity in each innovation component, which in turn would lead to more transformative well-being outcomes for residents.

Demircioglu and Audretsch (2017[12]) found that promoting a culture of experimentation within a public sector organisation, providing support and training to low-performing staff, creating feedback loops that allow for evaluation and adjustments, and motivating employees to make improvements are key conditions to spurring public sector innovation. Taken holistically, these activities can build an innovation culture across an entire city administration.

In fact, just as most cities consider innovation culture important to innovation (Figure 2.5), cities consider weak innovation culture a greater impediment to innovation than any other survey option (Figure 2.3). This is likely because these innovation components do not exist in a vacuum, but rather are interdependent on each other such that successfully building the capacity of one might rely on or assist in building the capacity of another. For instance, defining innovation and setting clear goals can lead to better measurement and evaluation of innovation activity (Gault, 2018[13]). In turn, robust measurement of innovation outcomes can help cities secure funding for innovation initiatives (OECD, 2020[14]). By prioritising a culture of innovation across the board, cities could increase their capacity in all components simultaneously rather than addressing each one in isolation.

Figure 2.3. Weak innovation culture is preventing most cities from enhancing innovation capacity

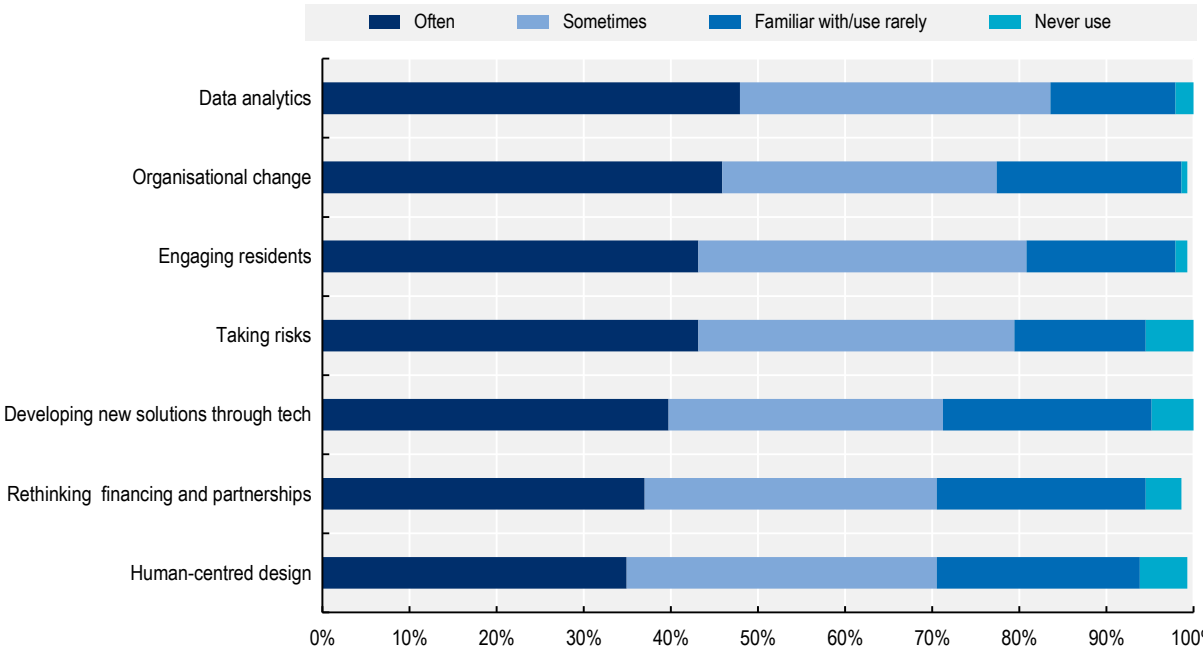


Note: Chart represents 83 cities' responses to Survey Question 5.9, "Which factors are lacking and prevent your municipality from enhancing its innovation capacity?"
Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

Despite the challenges implied in Figure 2.3, surveyed cities do appear to engage in activities that suggest a shift toward a stronger culture of innovation, including rethinking financing and partnerships, focusing on human-centred design and embracing data-driven analytics (Figure 2.4). Organisational change in city government can foment an innovation culture and bust down departmental siloes, overhaul internal performance management or enhance staff training and capacity building around innovation tools and techniques. Giving staff the freedom to take risks and fail also plays a role in building innovation culture and capacity. Demircioglu and Audretsch (2017[12]) find that promoting experimentation in a public sector organisation can enhance innovation, and Arundel, Bloch and Ferguson (2019[2]) suggest that a risk-averse culture can hamper it. Indeed, cities associate innovation with "experimentation" more than any other term (Figure 2.6).

Infusing a culture of innovation throughout a city administration makes it easier to bolster capacity in each component simultaneously. And a stable foundation of innovation culture enhances the likelihood that innovation activity will actually lead to improved residents' well-being.

Figure 2.4. Organisational change and risk-taking are among cities' most common innovation activities

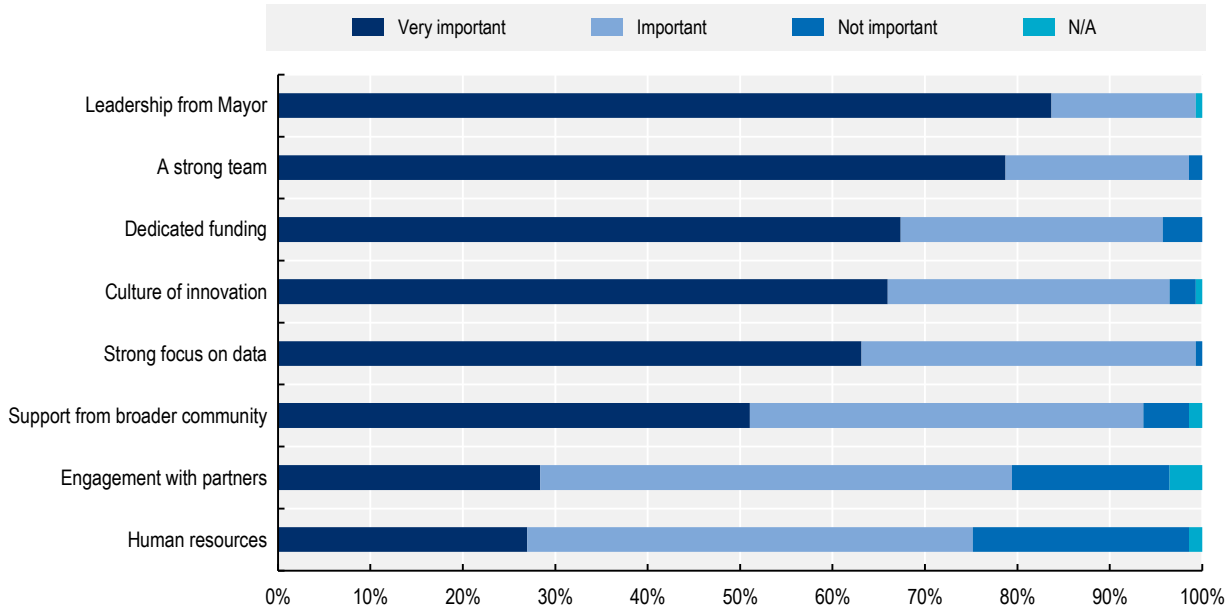


Note: Chart represents 146 cities' responses to Survey Question 1.10, "What would you say is the level of use for each of the following innovation activities in your city (at large)?" Some options equal slightly more/less than 100% because 1-2 cities answered "N/A".
Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

Leadership is the single most important factor in cities' innovation

All surveyed cities report that leadership is "Important" or "Very important" to public sector innovation (Figure 2.5). These results corroborate findings in the literature that an entrepreneurial and experimental approach by the mayor can be instrumental in building a city's innovation capacity. In a survey of 323 senior administrators from the city governments of Barcelona (Spain), Copenhagen (Denmark), and Rotterdam (Netherlands), results showed that "leadership has a bigger effect on innovation capacity than the structures, processes and contextual factors that drive innovation" (Lewis, Ricard and Klijn, 2018[15]). The OECD report *The Innovation Imperative* (2015[16]) listed "leadership and the way staff are selected, rewarded, socialised, and managed" as a major component of public sector innovation capacity.

Figure 2.5. Cities are unanimous about the importance of mayoral leadership to innovation



Note: Chart represents 141 cities' responses to Survey Question 5.8, "How important are the following factors or practices in supporting innovation in your municipality?"
Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

The five components of cities' innovation capacity

While crosscutting aspects of innovation capacity in cities such as culture and leadership deserve acknowledgement, the OECD/Bloomberg Survey focused on the five innovation components to generate specific, actionable insights. The following sections of the report mirror the structure of the OECD/Bloomberg Survey, exploring in as much granularity as possible cities' responses to key questions, with references where relevant to public sector innovation literature.

Insights come from each survey section: strategy (e.g. definitions, goals, and approaches); organisational staff and structure; funding and resources; data for innovation; and outcomes monitoring and evaluation. Significant crosscutting aspects are acknowledged wherever survey results from one component section are relevant to another. Qualitative anecdotes provided by cities illustrate the survey findings.

This in-depth exploration of the OECD/Bloomberg Survey highlights significant results based on 147 cities' responses, identifying trends and yielding recommendations. It also sets the stage for this chapter's following section, which ties the main findings of the OECD/Bloomberg Survey to quantitative data related to residents' well-being in cities.

Innovation strategies lay the essential groundwork for innovation in cities

Cities that define innovation alongside an official strategy and set of measurable goals are better positioned to ensure that investment, human resources and political capital dedicated to public sector innovation benefit residents. These strategies, goals, and even the definitions themselves will likely depend on a city's contextual needs and access to resources.

Local-level innovations improve services "sometimes in an impressive manner", but a lack of focus and planning may limit long-term benefits for cities and residents alike (Goldsmith and Kleiman, 2017[17]). Even innovation that occurs organically in the absence of any formal strategy can reap benefits; but "when it

comes to more systemic change, though, ad hoc innovation can give the illusion of widespread progress, distracting time and attention from the more difficult and broad-based need for structural innovation" (ibid).

Thus, by establishing these basic elements—a clear definition, measurable goals, and a coherent strategy—before undertaking public sector innovation endeavours, cities can avoid wasteful spending, increase public accountability, and start the process of building an innovation culture crucial to improving resident well-being. For example, Las Vegas (United States) developed "strategic, outcome-oriented goals" and corresponding metrics to effectively restructure siloed agencies and build more cross-departmental collaboration so they could work on common issues, leading to a more efficient consolidation of resources and a more holistic approach to challenges that do not fit neatly into the jurisdiction of any one city agency. By developing a clear strategy for improving the way they work together, Las Vegas "has ensured that it remains responsible for delivering effective service to its residents" (Box 2.4) (Goldsmith, 2018[18]).

Box 2.4. Restructuring strategic planning and performance review of agencies in Las Vegas

Before Las Vegas made major changes to its agency planning and review systems with the help of What Works Cities, budget decisions were being made before departments generated their strategic plans, leaving them unable to advocate for the funding necessary to achieve their goals. After the realignment, agencies solidified their strategic plans months before the annual budget process, allowing them to "use their business plan as a narrative justification for budget requests".

De-siloing departmental performance reviews also had a substantive impact on city agencies' progress toward addressing core challenges. Before changes were made, each department would meet "individually once or twice a year with the city manager executive team", even though many agencies were working on shared issues from different angles. Agency representatives in these review meetings "usually talked about critical issues in their departments, not on ways of meeting broader city goals".

The process adjustment led to the establishment of four thematic cross-departmental priorities: (1) growing the economy, (2) neighbourhood liveability, (3) community risk reduction and (4) high-performing government. Now, instead of one or two individual review meetings a year, "between three and six departments meet with the city manager at a time to discuss a specific theme," up to eight times per year.

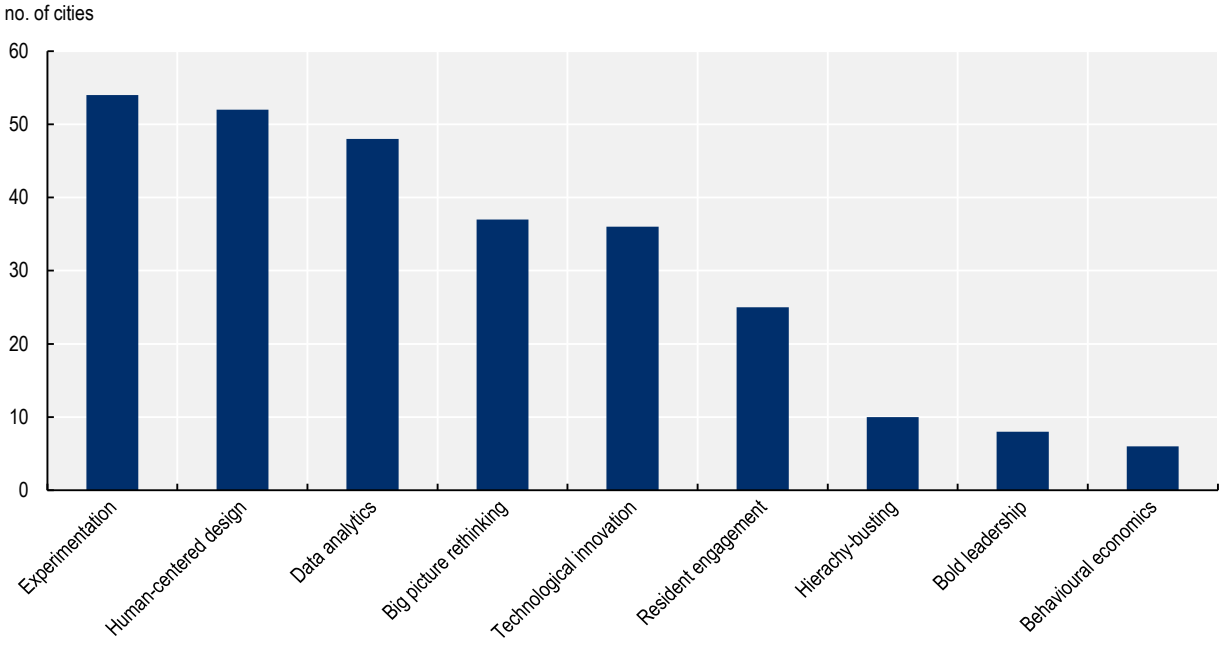
Source: (Goldsmith, 2018[18])

Defining public sector innovation is the first step to building an effective strategy

Before measuring innovation's impact on residents' well-being, cities must address ambiguities around the term "innovation". While references to "innovation" meet little resistance in cities thanks in part to increased funding opportunities associated with its use, the term has different interpretations depending on the city administration. This ambiguity may deter mayors from pursuing such initiatives altogether. Defining public sector innovation may be the first step in enabling cities to reap its benefits.

Gault (2018[13]) asserts that the lack of an international standard that defines public sector innovation represents a "significant gap which prevents the analysis and understanding of innovation," and that defining it is prerequisite to forming indicators that "can be used to inform policy development and for monitoring and evaluation of existing policy." In other words, public sector innovation must first be defined in order to deploy it and generate improvements in residents' well-being.

Figure 2.6. Cities most associate "experimentation" and "human-centred design" with innovation



Note: Chart represents 146 cities' responses to Survey Question 1.6, "Please select two terms that your municipality most centrally associates with innovation capacity." Thus, the chart shows 276 responses total: two for each city, minus some non-responses.
Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

Though not the same as a formal definition, the terms that cities associate with innovation (Figure 2.6) shed light on the different perceptions of innovation. "Experimentation", "Human-centred design", and "Big picture rethinking" feature prominently among the results, indicating that cities see innovation as an opportunity to look outside-the-box and approach service delivery through the perspective of intended beneficiaries (e.g. residents). Meanwhile, more technical answers like "Data analytics" and "Technological innovation" suggest that many cities see technology and data as integral to innovation activity. By contrast, while human-centred design is one well-known type of "Resident engagement", it is noteworthy that engagement appears less on cities' minds when they think of innovation. This seems consistent with the fact that very few cities claim that innovation helps them engage with stakeholders (Figure 2.1). The apparent deprioritising of resident engagement as an outcome of public sector innovation may represent an opportunity for renewed focus in this area for cities. As discussed later in this section, certain public sector innovation approaches and methods, including co-creation and human-centred design, can increase both well-being outcomes and direct engagement for residents. Engaging with residents and soliciting their feedback as active partners in the innovation process can have marked positive impacts on the quality of cities' innovation efforts (Arundel and Es-Sadki, 2019[5]; Kleiman and Goldsmith, 2018[9]).

Figure 2.6 suggests that cities see public sector innovation as something that entails risk-taking, trial-and-error, and the freedom to experiment; that focuses on outcomes for residents (but does not necessarily engage them directly); and that involves some level of technological and scientific sophistication.

Strategies and goals lead to better innovation outcomes

Part of cities' efforts to define public sector innovation entails establishing clear strategies and measurable goals. By doing so before investing resources and political capital in innovation projects, cities can ensure that decisions are intentional, guided by a cohesive and coherent vision, and subject to public accountability (OECD, 2019[19]). This may prevent spending that is wasteful and/or done for political gains rather than for the benefit of taxpayers. Without an explicit, publicly stated definition, strategy or goals,

"innovation activity might be triggered by motives other than customer value, such as increasing one's status or power…following a fashion, or signalling progressiveness" (Salge and Vera, 2012[6]). In such cases, "public service organisations might generate innovations that are meaningless from a customer perspective," failing to make a positive impact on service quality or even having a negative impact if resources are allocated away from normal service provision.

Therefore, strategic plans for innovation–especially through resident-inclusive processes like human-centred design and co-creation–can simultaneously help cities avoid wasteful spending and reflect the preferences of residents, fostering accountability. As discussed in "Public sector innovation capacity and residents' ", public sector innovations implemented in accordance with a clearly defined, publicly stated strategy and measurable goals that benefit residents can increase the likelihood that they survive from one public administration to the next.

More than half of surveyed cities report having formal innovation goals. However, just half report having a formal innovation strategy, with only 39% among US cities. This may hamper cities' ability to build capacity for other components: a clear formal strategy can clarify staffing needs, inform and justify funding needs, and establish measurable outcomes that facilitate evaluation. Thus, insufficient strategic planning and goal setting around innovation may limit cities' ability to generate greater well-being outcomes for residents.

Conversely, cities are better positioned to generate tangible benefits for residents by defining innovation and establishing a coherent strategy, approach, and goals *before* investing time and resources to implement them. For example, Mexico City defined its innovation goals and strategies beforehand so they could identify the most effective opportunities to address urgent issues and measure outcomes, rather than conducting scattershot innovation poorly aligned with resident needs. In order to achieve their innovation goals, Mexico City created the Digital Agency for Public Innovation (ADIP), which brought their data analysis, open government, and e-government capabilities under one roof. The ADIP plans its work around three central strategic goals: (1) increasing public internet access by providing free Wi-Fi; (2) developing digital tools for use by citizens to increase government accountability; and (3) by creating e-government instruments to improve public service delivery. So far, ADIP's efforts toward its stated goal for providing Wi-Fi as a Human Right have resulted in the installation of 13,963 free Wi-Fi areas around the city. As part of its innovation strategy to deepen civic engagement, ADIP has also created numerous virtual and physical spaces where residents can access information, provide feedback on service delivery, engage in policy discussions, and offer solutions to problems in their communities.

Indeed, while research suggests that minor innovations can occur organically, regardless of whether a strategy is embedded into governance, "the probability of producing transformative or 'breakthrough' innovations could be enhanced by governance that supports strategic innovation management." Examples of strategic management can include "a written innovation strategy, the inclusion of innovation targets in annual reports, the participation of managers in an ongoing innovation task force, and the active participation of politicians in innovation." (Arundel, Bloch and Ferguson, 2019[2])

Certain Inclusive approaches and methods can enhance impact on well-being

While any focus on public sector innovation can impact residents' lives, cities can increase the depth of that impact by adopting approaches that prioritise and engage residents. According to OECD findings (2020[14]), "innovative organisations are those which have the resources and skills in both the implementation and evaluation of innovative approaches."

These most "innovative approaches" might be those that focus on the needs of and/or solicit feedback from residents, often referred to in public sector innovation as "customers" or "end-users". For example, in an analysis of 153 hospitals within the UK's National Health System, Salge and Vera (2012[6]) conclude that public service quality increases with more customer- and learning-oriented approaches to innovation, which in the case of hospitals "might translate…into saving lives". Thenint (2010[3]) argues that public sector

innovation “should principally aim at addressing societal challenges…accordingly, innovative thinking and operating may require strong user-centred approaches”.

Innovative approaches like co-creation, human-centred design, experimentation, strategic partnerships, and nudge economics could augment the impact of public sector innovation. The public sector’s approach to innovation is often too narrow, focusing on cost-saving, efficiency and operations at the expense of more transformative changes. A majority of surveyed cities report engaging residents, using human-centred design and rethinking partnerships as part of their innovation activity. While this is encouraging, cities might want to increase their emphasis on innovative approaches geared toward resident engagement. Not only can feedback through various forms of engagement inform conceptualisation and implementation, but resident engagement is also a positive in its own right (Voorberg, Bekkers and Tummers, 2015[20]). Cities with more resident engagement tend to have higher satisfaction rates among residents, and engaging with residents from traditionally underrepresented groups could be effective in combatting inequality and ensuring more targeted service delivery.

Co-creation and innovation labs

Co-creation refers to the “active involvement of end-users in various stages of the production process”, and in the public sector, “these end-users are citizens” (Voorberg, Bekkers and Tummers, 2015[20]). In the face of societal challenges and austerity policy from central governments, policy makers increasingly consider co-creation with residents “as a necessary condition to create innovative public services that actually meet the needs of citizens” (ibid). Innovation labs operated by city governments are a key inflection point for co-creation and appear to “support the determinants of urban innovation capacity” (Vrabie and Ianole-Călin, 2020[21]).

Surveyed cities appear interested in both the co-creation approach and innovation lab methods, with a great deal of co-creation executed through cities’ innovation labs. A combined 80% of cities report engaging residents in new ways either sometimes or often through their innovation activity (including but not limited to co-creation). Meanwhile, three out of four cities believe their city staff “would want or benefit from” training in innovation labs, while nearly two out of three feel the same about collaborative approaches like co-creation. These results suggest interest in co-creation and innovation labs, even if application lags.

The exciting outcomes of some surveyed cities’ co-creation and innovation lab efforts might encourage others to explore investment in these collaborative approaches. Montreal’s (Canada) co-creation CityStudio leverages the knowledge of local students to improve the community, while Leipzig’s (Germany) Thinking Ahead project facilitates civic participation and brings together residents, elected officials, and experts to collaborate on sustainable urban development (Box 2.5). These efforts accomplish the dual benefit of engaging residents as partners in innovation and generating targeted interventions that can save cities time and effort in implementation.

Even when co-creation lacks a specific objective or fails to produce a tangible outcome, it can still contribute to resident well-being by fostering civic engagement and a sense of community for its own sake. Fugslang and Hansen (2019[22]) found that innovation labs often have unique characteristics relative to other public sector innovation approaches, including an ability to facilitate “democratic engagement”. Indeed, in a synthesis of co-creation studies, Voorberg, Bekkers and Tummers (2015[20]) found that resident engagement is perceived “as a value in itself, which is also supported by the observation that several authors addressed the increase in citizen involvement as an objective to be met.”

This appears to be the case for Cornella’s (Spain) CitiLab (Box 2.7), which has ardent defenders in the local government and community based on the belief that increasing civic engagement represents a positive impact on resident well-being (Gascó, 2017[23]). Investment in co-creation led to a significant increase in civic engagement In Bologna (Italy) as well (Box 2.5).

Box 2.5. Co-creation pilots provide new perspectives and boost civic participation

Montreal, Canada: CityStudio Montreal connects city staff expertise and student creativity to tackle complex urban issues. The initiative matches urban problems identified by city staff with courses at partner universities, providing public servants and students a chance to co-create and prototype innovative solutions. CityStudio Montreal serves as a unique method to strengthen civic participation and resident engagement through collaboration to improve the community.

Leipzig, Germany: Launched in 2012, Leipzig Thinking Ahead co-ordinates civic participation within the City Council. By bringing together residents, politicians, policy makers and experts, the initiative aims to resolve challenges related to sustainable urban development in the city. Leipzig Thinking Ahead fosters a culture of resident engagement through various methods such as virtual spaces, a future series, surveys and the use of Lego building blocks to co-create a vision for the city.

Bologna, Italy: The Civic Imagination Office serves as an urban policy lab to research, communicate, and co-design urban transformations. The Office oversees six District Labs, where city officials and residents collaborate on projects to tackle challenges facing Bologna. These Labs guide citizens' project proposals (called collaboration pacts) and facilitate the participatory budgeting process, leading to a significant increase in citizen engagement: more than 480 collaboration pacts implemented, and more than 14 000 votes in the first year of participatory budgeting.

Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

Human-centred design

Bloomberg.org (2019[24]) defines human-centred design as "an approach to creating a programme, policy, service, or product that is tailored to the needs of the person who will use or be impacted by it." In other words, human-centred design ensures that the nature of public services are dictated by what works best for end-users rather than by bureaucracy or legalese. By reframing innovation this way, cities can imagine ways of doing things beyond existing paradigms.

Cities responding to the OECD/Bloomberg Survey seem to deploy the human-centred design approach at a slightly lower rate than other forms of resident engagement (Figure 2.4): 36% of cities use human-centred design sometimes, while 35% use it often. In its Survey response, Edmonton, Canada, described its human-centred design efforts to improve urban well-being, approach issues from the perspective of those directly affected and refine services based on end-user feedback (Box 2.6).

Box 2.6. Using human-centred design to address urban well-being in Edmonton, Canada

Edmonton's response to survey question 5.11 concerning its novel innovation efforts:

"Our city has created a human-centred framework using social innovation to improve urban well-being (www.urbanwellnessedmonton.com). We begin with ethnographic research to understand and make sense of the stories [of] people living rough on the streets. These stories build empathy and define issues from the perspective of people who are marginalised.

The research and analysis of folks' behaviours, pain points, and aspirations lead to different groupings of people, or segments, such as the Edgeworkers who engage in informal professions on the edge of society using their intuition and survival skills. With these stories in mind, we ideate with the community at large: What kind of solutions might work for different segments? Ideation generates hundreds of possibilities.

Based on energy and interest, we home in on a few ideas and form prototype teams with community members and leaders to test them out, going back to people directly experiencing challenges like those chronically street-involved and co-creating potential solutions based on end-user feedback. Solutions that are most promising are then scaled through new and enhanced partnerships.

As helpful as these processes were, after two years of work, we realised that they didn't take us to the transformational place needed for change. Deeply listening to the people we are designing for has shifted the way we define well-being and resulted in a framework that holds connection at its core. While the material needs that governments commonly focus on are important (like physical housing), we are elevating the importance of the immaterial aspects of well-being, by including concepts such as 'purpose' 'culture' and the 'sacred' in our designs. We believe that designing, testing, and scaling prototypes with this orientation will move us closer towards the systemic level change we are striving for."

Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

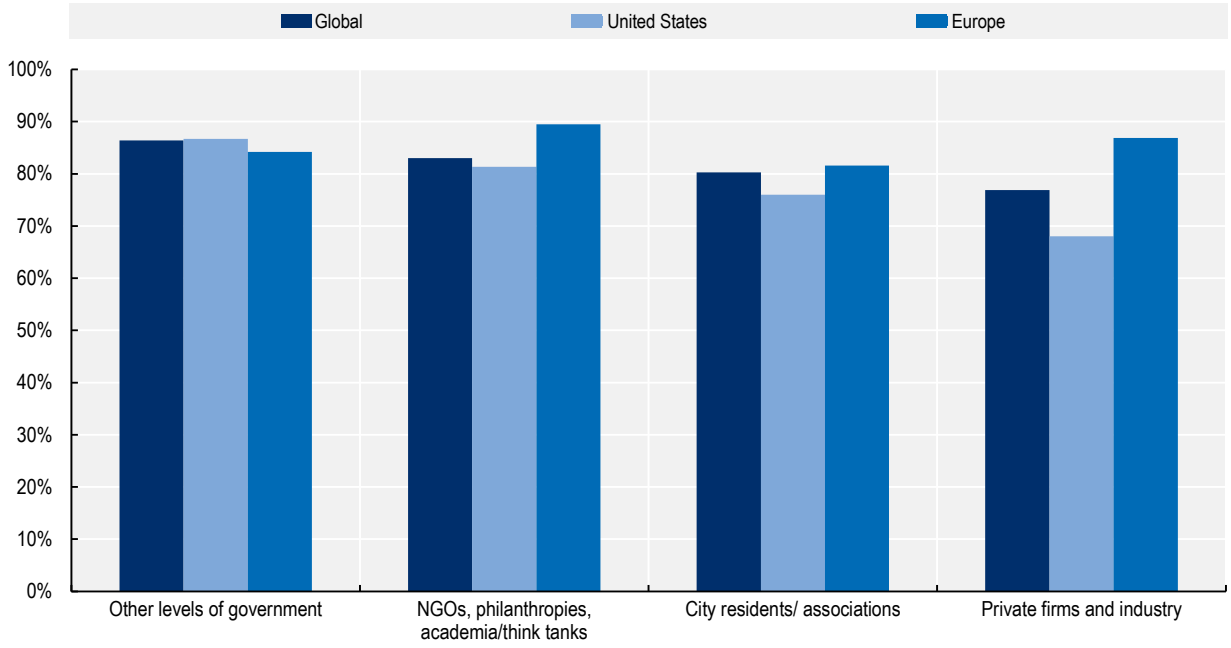
Partnerships

Due to constraints on staffing, funding, technical capacity, etc., cities might benefit from partnerships with other sectors and levels of government as part of their approach to public sector innovation. Collaboration with the private, non-profit, philanthropic, academic, and/or think-tank sectors, and with other levels of the public sector can help cities "enhance approaches and tools, share risk, and harness available information and resources for innovation" (OECD, 2015[16]). Public sector innovation partnerships could also include collaboration and engagement with citizens in the form of innovation labs, hackathons and open data sharing. According to Janssen et al. (2017[1]), promotion of data-driven public sector innovation might require a "major role" from "private organisations and citizens".

A majority of surveyed cities report engaging in partnerships (Figure 2.7). These can help cities compensate for resource- or skill-related shortcomings that might impede innovation. Whether it means providing seed funding for innovation activity, data use training, analytics, storage capacity, access to large swaths of data or professional development for staff based on their innovation experience, strategic partnerships can augment cities' capacity to innovate. The nature of a city's partnership may depend on local context, e.g. the industry composition, academic landscape, or nature of higher levels of government. Partnerships should also contribute to a city's innovation strategy and goals rather than adopting a partnership as a "solution in search of a problem".

For example, San Pedro Garza García, Mexico, created a Department of Innovation and Public Engagement, which forged two important partnerships. The Innovation Department collaborates on data strategy with the city's specialised unit to fight domestic violence, and it launched a City Innovation Fellowship with *Tecnologico de Monterrey* (ITESM) university. As this example suggests, cities may benefit from partnerships around data (see "Data use can inform strategy, guide funding decisions, and evaluate goals for innovation").

Figure 2.7. Cities engage in innovation partnerships, especially with other levels of government



Note: Chart represents 147 cities' responses to Survey Question 1.11, "To what extent does your city's innovation work include partnerships within and outside the municipal administration?"
Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

Organisational structure and staffing

Employee skill levels and organisational structure are pivotal to expanding public sector innovation capacity in cities. "Forming a team dedicated to finding new solutions to vexing urban issues sounds so simple, but innovation teams are a relatively new addition to the local government landscape" (Goldsmith and Kleiman, 2017[17]). Governments at all levels often "lack the flexibility, culture, and guidance that could help innovation to flourish" (OECD, 2015[16]). Initiatives such as Bloomberg Philanthropies' i-teams (innovation teams) and What Works Cities help cities address barriers around staff skills to develop their capacity for public sector innovation and data analytics.

Cities can increase their innovation capacity by developing a more conducive organisational structure that encourages experimentation, cross-sectoral collaboration, risk-taking and room to fail. Cities can also build staff capacity for innovation by prioritising innovation skills and experience in their hiring practices and ongoing professional development. Among existing staff, cities can increase the capacity for innovation through support and training, creating feedback loops that allow for evaluation and adjustments, and motivating employees to make improvements (Demircioglu and Audretsch, 2017[12]). As Figure 2.3 shows, two out of five surveyed cities believe poor "Human resource involvement, support, and training" prevents them from enhancing innovation capacity.

Decisions about whether to disperse innovation through existing administrative structures or create a separate department for innovation have different repercussions for capacity. Innovation teams "depend on strong relationships with city agencies", and if provided "with a mandate of crosscutting and cross-agency change, the teams can authorise new approaches to addressing an issue, but they must first get information and buy-in from the people who will be implementing the plans" (Goldsmith and Kleiman, 2017[17]). Efforts to infuse innovation into the fabric of public sector organisations can yield innovation sourced directly from staff, permitting them to apply their institutional knowledge in a way that improves residents' well-being.

Focus on innovation staffing can also bring new skills and perspectives into the public sector, allowing managers to overhaul the culture of public sector organisations and transform their impact on residents' lives. Goldsmith and Kleiman (2017[17]) say about the importance and challenges of innovation teams:

> *More than any other municipal innovation, these teams embody core attributes of the [new approach to urban governance]: clarity around ambitious new outcomes, speed, and a core focus on empowering and unleashing the creative ideas that often lie dormant within city agencies and among residents.*
>
> *Innovation teams are often a small interdisciplinary band of data, design, research, and project management pros aimed at some of the highest-level and most complicated city priorities, such as lowering the Homicide rate, devising a climate action plan, or addressing persistent poverty. These special teams are usually comprised of individuals drawn from the private and public sectors, serving as something akin to internal consultants…Because they are not bogged down in day-to-day operations, one of the virtues of innovation teams is flexibility, and they tend to take on a range of issues.*

The importance of leadership to building innovation capacity can be seen in staffing as well. Hiring innovation stewards and senior managers with entrepreneurial mindsets and innovation experience can grow a city's innovation capacity and foster a culture of innovation that persists through staff turnover (Arundel, Bloch and Ferguson, 2019[2]).

As captured in Figure 2.2, 90% of cities report staff dedicated to innovation – the most common of any component measured by the Survey. This indicates that cities view staffing for innovation as foundational to broader innovation capacity and initiating innovation activity. While each innovation component depends on the others to some extent, staffing for innovation may play an outsized role in getting cities' innovation efforts off the ground in earnest.

Professional backgrounds of innovation teams may reflect cities' priorities

Placing a premium on hiring innovation staff with relevant professional backgrounds can help cities build innovation capacity quickly. The OECD (2017[25]) identifies human resource management as "an important lever for supporting public sector innovation by enabling managers and front-line staff to formulate ideas that result in new and improved ways to deliver public services."

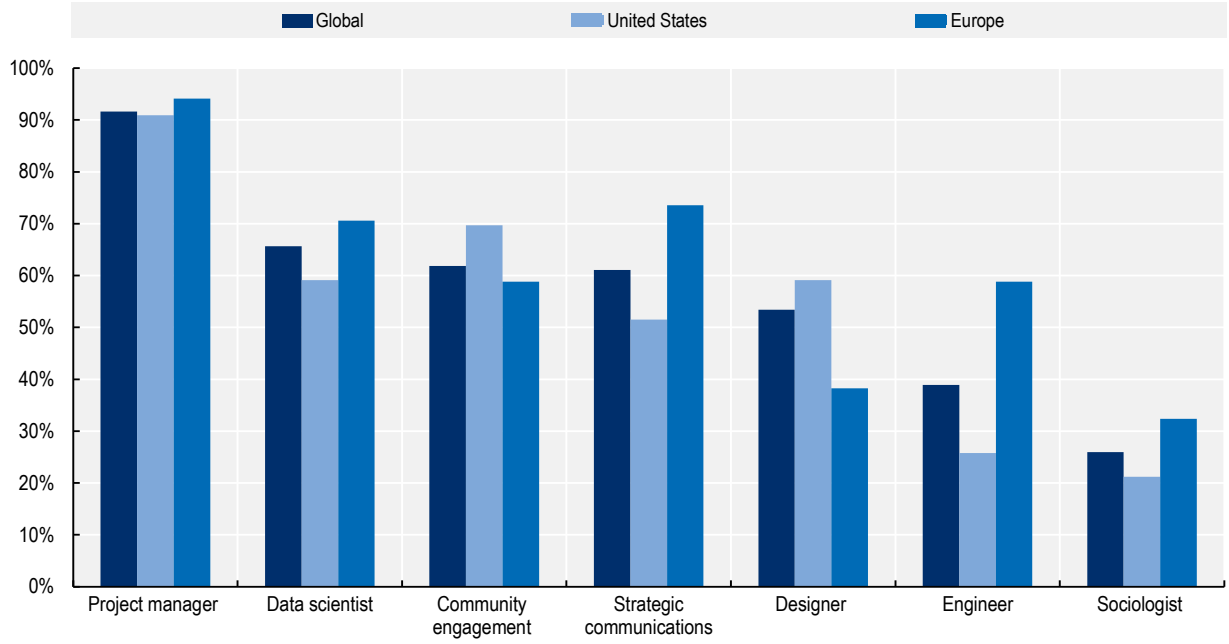
The current and desired backgrounds of surveyed cities' innovation teams reveal to some extent what those teams focus on, and what cities look for in recruitment. Over 90% of cities report staff with a project management background (a far higher rate than any other role), suggesting that cities predominantly take a project-based approach to innovation (Figure 2.8). The second most common role among innovation teams is data scientist, which bodes well for cities' efforts to build capacity in data use (discussed below). On the other hand, engineers are less prevalent in cities than every role but sociologists—however, a noteworthy gap exists between world regions in the prevalence of engineers: 59% of European cities report having an engineer on their innovation staff, versus just 25% of US cities.

Also noteworthy is that just over half of cities report a designer on their innovation team. This number is somewhat underwhelming considering that the role of a designer is associated with the human-centred design approach, which has proven effective in ensuring that public sector innovation in cities contributes to resident's well-being. Like engineers, the prevalence of designers among innovation teams differs by

region: while 59% of US cities report having one on staff, only 38% of European cities do. Reducing the relative lack in professionals with a design background could bring "a few tools that are new to many local governments," including ethnographic research, problem synthesis, and low-cost prototyping of new ideas that can be piloted with residents for feedback (Bloomberg.org, 2019[24]). While anybody could deploy these principles of human-centred design, designers have the training and experience to do so.

Cities employ staff for community engagement and strategic communications for innovation at a slightly higher rate than for design. Although engagement and communication do not necessarily mean that residents are actively involved in the design process of innovation, it is encouraging that cities are trying to include residents in their innovation activity. Human-centred design provides an opportunity for cities to adopt a design process approach to innovation while fostering resident engagement.

Figure 2.8. Almost all dedicated innovation teams have staff with project management background

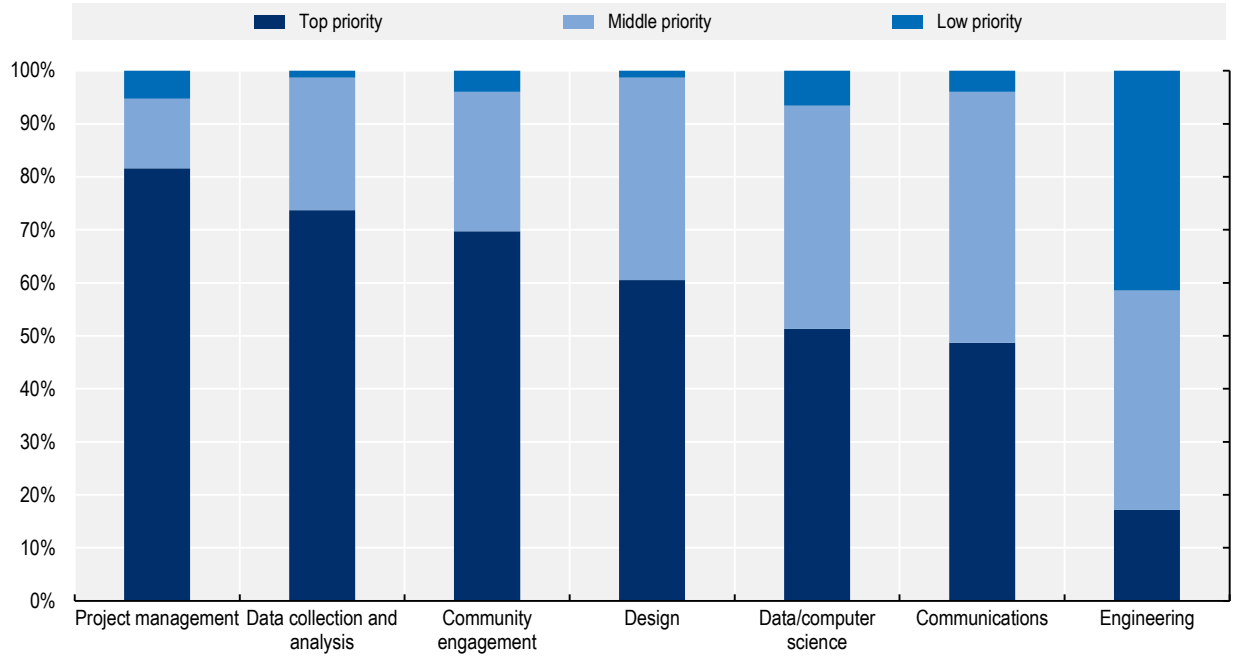


Note: Chart represents 131 cities' responses to Survey Question 2.5, "What types of professional roles make up your city's innovation staff?"
Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

While the results shown in Figure 2.8 suggest room for growth in certain areas among cities' innovation teams, they also reflect the skills cities view as necessary for innovation work. While cities consider project management, data collection and analysis, and community engagement as top priorities for staff to execute innovation, they evidently do not feel the same about engineering (Figure 2.9). This may reflect that, while public sector innovation stands to benefit from technology-focused advances, it is not the total of innovation activity. Public sector innovation activity is more diverse and a manifestation of each city's specific context.

Along with the low prioritisation for engineers, the disparity in Figure 2.9 between "Data collection and analysis" and "Data/computer science" connotes that, while cities need staff that can execute some basic data work, highly advanced tech or data specialists may not be necessary. If true, this might reveal a crucial nuance for staff hiring and training: instead of cities spending innovation budgets on expensive specialists, they can focus on training existing staff in data collection and analysis skills. Indeed, over 60% of surveyed cities report spending their innovation budget on staff training, among other expenses. This approach is not only cost-effective, but allows cities to diffuse data and innovation culture throughout their administrations while retaining existing staff who possess valuable institutional knowledge.

Figure 2.9. Cities see project management and data work as most important to staffing innovation



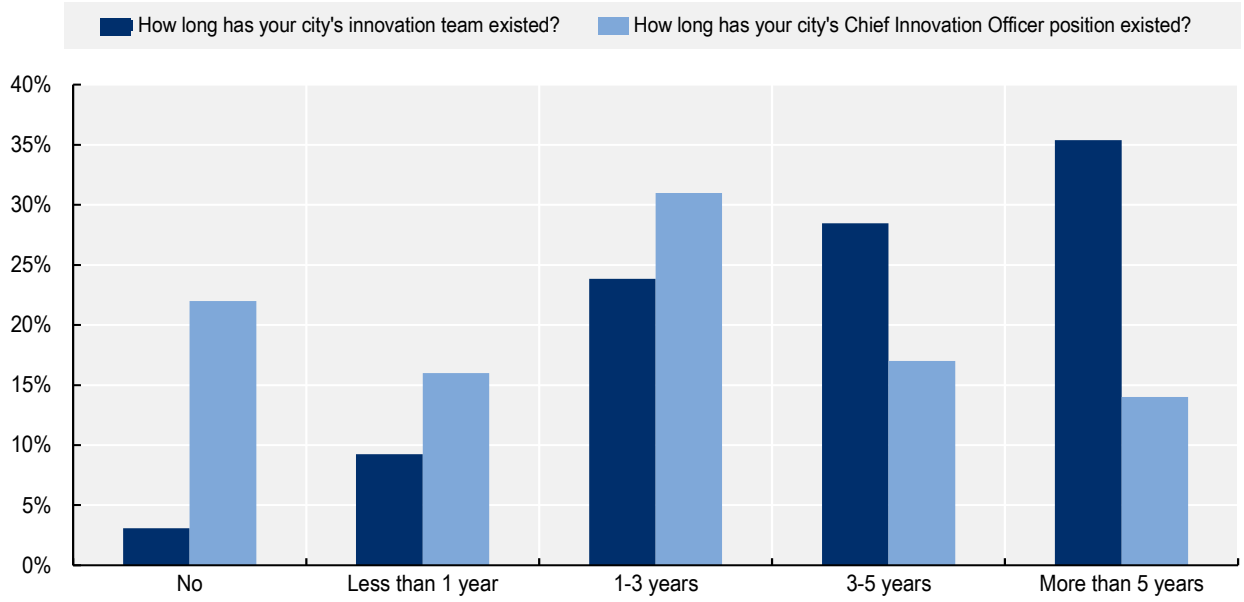
Note: Chart represents 76 cities' responses to Survey Question 2.6, "What types of professional skills do you think are necessary to successfully engage in innovation work?"
Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

Moreover, as shown in Figure 2.3, a lack of human resource involvement and a strong team are among the factors preventing cities from enhancing their innovation activity (in addition to a culture of innovation, including among staff). Conversely, all but two surveyed cities report that a strong innovation team is "Important" or "Very important" to innovation activity (Figure 2.5). Thus, cities can leverage their human resources departments to bring on experienced and skilled innovation staff, helping to reset a public sector organisation's culture and structure.

Innovation teams are new and champions few

While over 90% of surveyed cities report having an innovation team, most are still in early development (Figure 2.10). Encouragingly, just four cities (3%) report no innovation team – meaning that most surveyed cities are somewhere in the process of building capacity in the staff and organisational structure component of innovation. About a third of cities have had innovation teams for over five years, a likely sign that innovation is increasingly mainstreamed in the culture of those administrations. However, 60% of cities' innovation teams are less than five years old, and a third are less than three years old. As we shall see in the section on evaluating innovation outcomes, below, the age of cities' innovation teams may have important repercussions for cities' capacity to evaluate innovation outcomes (Table 2.2).

Figure 2.10. Most cities have an innovation team, but Chief Innovation Officers are less prevalent



Note: Chart represents 130 cities' responses to Survey Question 2.9, "How long has an Innovation team existed?" as well as 77 cities' responses to Survey Question 2.8, "How long has the Chief Innovation Officer position existed?"
Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

Compared to cities' innovation teams, the presence of a Chief Innovation Officer (CIO) is even more nascent, and non-existent in more cases. This is significant, considering the ample evidence both in survey results (Figure 2.5) and public sector innovation research literature that leadership plays an integral role in driving innovation capacity. While such evidence often refers to mayoral leadership, it is also important that cities have an innovation "champion" or "sponsor" (Bartlett and Dibben, 2002[26]), including among senior managers, and managers within public sector organisations who have an entrepreneurial mind-set, previous experience with innovation, and a positive attitude toward risk and change (Arundel, Bloch and Ferguson, 2019[2]). Indeed, "the personal characteristics" of managers are important to building innovation culture in a public sector organisation (Arundel, Bloch and Ferguson, 2019[2]).

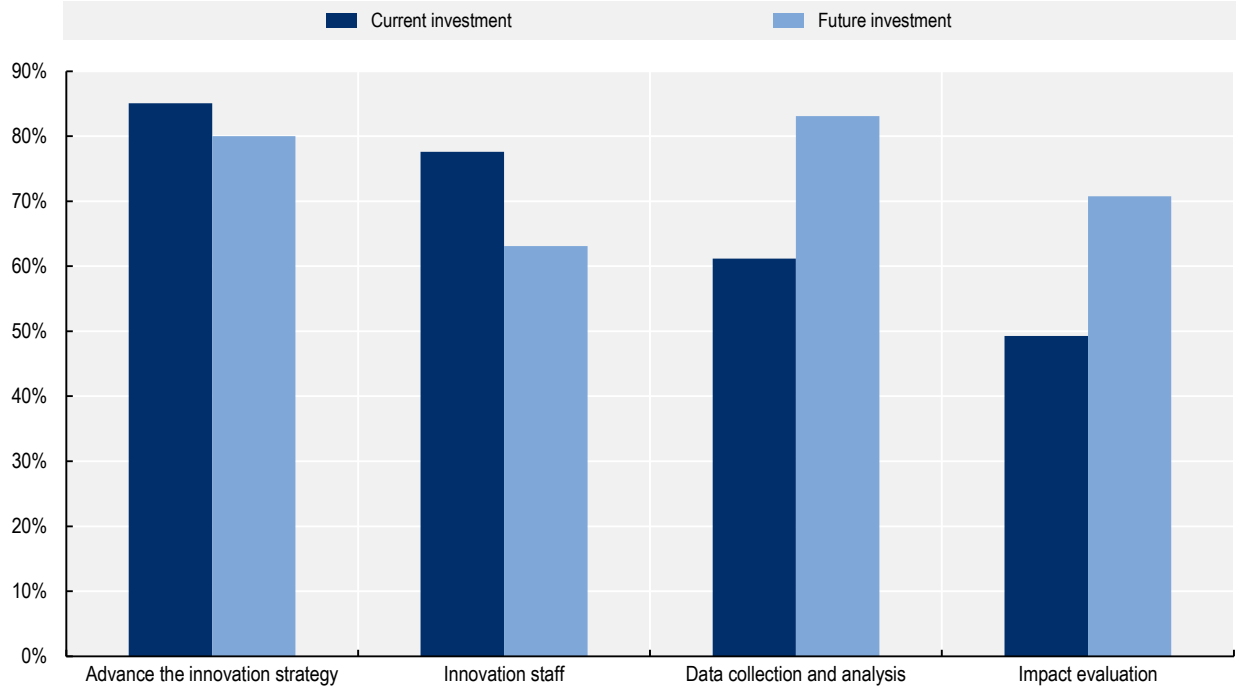
Like cities' innovation teams, under two-thirds of surveyed cities with CIOs have held the position for less than five years. However, unlike cities' innovation teams, over a third of which have existed for over five years, just 14% of cities have had CIOs for the same period. More telling, whereas just 3% of cities report not having an innovation team, 22% of cities report not having a CIO position at all. This discrepancy may be in part because "CIO" is not a familiar concept for European cities, some of whom may have Smart City or Digital Innovation Manager positions instead. When analysed by region, 84% of US cities have CIOs compared to 67% of their European counterparts, and a third of the latter for less than one year.

The lack of a dedicated CIO to oversee and advocate for innovation within the administration could limit the attention and funding that innovation receives. As innovation activity matures, "as well as technical skills, there is a need for greater political and advocacy skills," to ensure that innovation programming receives the resources it needs to impact residents' lives (OECD, 2020[14]). Thus, developing this position could help administrations raise the profile of public sector innovation activity in cities and cement innovation as part of city government.

Despite the comparative lag around the CIO position, Figure 2.10 demonstrates that cities have been successfully building up their innovation teams over the past few years. But while a hiring blitz may have been necessary to build out these teams and orient cities toward innovation activity, it may not persist.

Cities with more established innovation capacity appear to adjust their budgets away from staff expenditures toward data analysis and impact evaluation (Figure 2.11). One possible explanation is that defining an innovation strategy and dedicating staff to innovation is necessary to get a city's innovation programme up and running, while leveraging data for innovation and evaluating innovation outcomes are natural next steps once programming matures. In other words, once cities establish a formal innovation strategy and install an innovation team, they will transition funding from initial programming and staffing to a stronger focus on metrics and results.

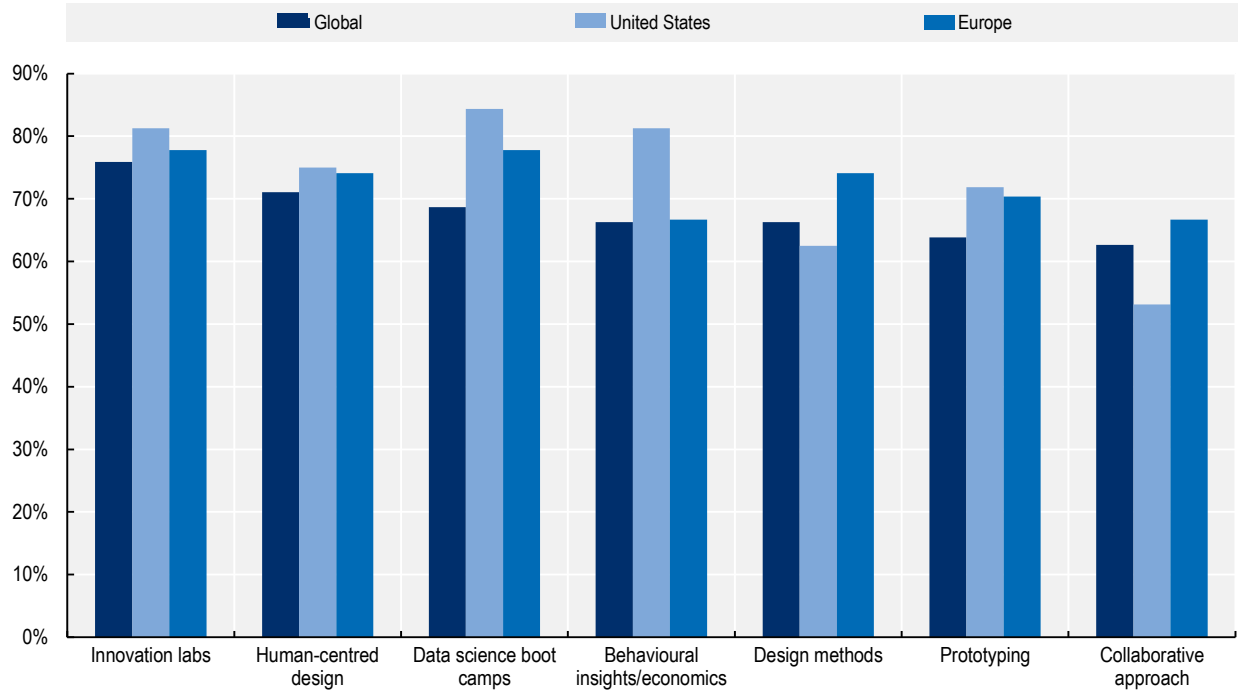
Figure 2.11. Fewer cities plan to spend on strategy and staff, more on data and metrics



Note: Chart represents 67 cities' responses to Survey Question 3.3, "To which innovation capacity components are these resources allocated?" and 65 cities' responses to Question 3.6, "In which innovation components do you plan to invest?" Responses were provided in advance of COVID-19.
Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

Apart from hiring practices designed to add staff with innovation skills**,** staff training is another human resources lever to build staff skills and culture. According to the OECD (2017[25]), 60% of OECD countries make some form of innovation training available to employees. Belgium, Canada and Korea go further by integrating professional development for innovation into their core staff trainings. Figure 2.12 conveys that most cities' staff are interested in training in innovation methods and approaches, especially innovation labs. As discussed above, innovation labs have several unique characteristics that may interest city innovation staff, including providing space for both a physical and mental framing of innovation activities, inducing organisational learning for all stakeholders, and holding potential for direct democratic engagement with residents (Fuglsang and Hansen, 2019[22]). Notable regional differences include US cities expressing more interest in behavioural economics than European ones, while European cities appear more interested in design methods and collaborative approaches (e.g. human-centred design).

Figure 2.12. Cities' staff are interested in a variety of innovation methods and approaches



Note: Chart represents 83 cities' responses to Survey Question 1.12, "Are there any types of innovation methods or approaches in which your city staff would want or benefit from training?"
Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

Stable funding is crucial to transformative innovation—but many cities are on their own

While it is possible for cities to innovate creatively despite budget constraints, insufficient funding can stifle investment in the staff skills, data capacity and development of evaluation methods that facilitate transformative innovation. Inadequate funding to build out these components can create a vicious cycle: without the capacity to demonstrate innovation's impact on residents' well-being, cities could struggle to access the long-term funding to maintain and scale up even the most successful innovation programmes (Box 2.7).

Thus, cities need the funding component to bolster other innovation components, which can in turn unlock more funding in the future. Survey results demonstrate that cities are committed to maintaining funding for public sector innovation and have plans to source gap funding from a variety of external sources. However, governments at all levels "encounter important challenges in generating adequate support and finding the right resources to foster innovation" (OECD, 2015[16]).

Box 2.7. Cornellà's (Spain) CitiLab: A success with residents, but a struggle for funding

The case of Cornellà's CitiLab demonstrates how a lack of measurable results can put at risk funding for even a successful innovation programme. Cornellà's CitiLab operates as a co-creation space and innovation lab where residents, practitioners, experts and civil society organisations collaborate and interact. CitiLab is proud of its resident engagement: as of 2015, Citilab had 7 000 "citilabbers", or dues-paying members actively engaged in projects, plus 25 000 occasional participants.

While CitiLab has not produced much evidence of positive outcomes for residents, CitiLab practitioners believe that "innovation outcomes do not seem relevant", and what matters most "is the process of empowering people, of making them realise that they can innovate and that they can have an idea to solve a problem that may affect them." This type of citizen empowerment can itself constitute an improvement to resident's well-being, increasing their sense of ability to generate change in society.

The need to maintain CitiLab was called into question eight years after its launch in 2016, despite clear interest and engagement from residents. A major source of scepticism was a lack of metrics around outcomes of CitiLab projects. Thus, the Spanish Ministry of Industry cut its investment in CitiLab in 2016, leading to "economic difficulties" and making Cornellà City Council the primary funder.

While the City Council is willing to fund CitiLab, observers acknowledge that Cornellà "will not be able to sustain its investment much longer if there is no clear return" on investment. Even supporters of CitiLab admit "it is not easy to justify investment" when the city has many other critical expenses and that "it is very frustrating to spend EUR 800 000 a year…and not see a short-run improvement".

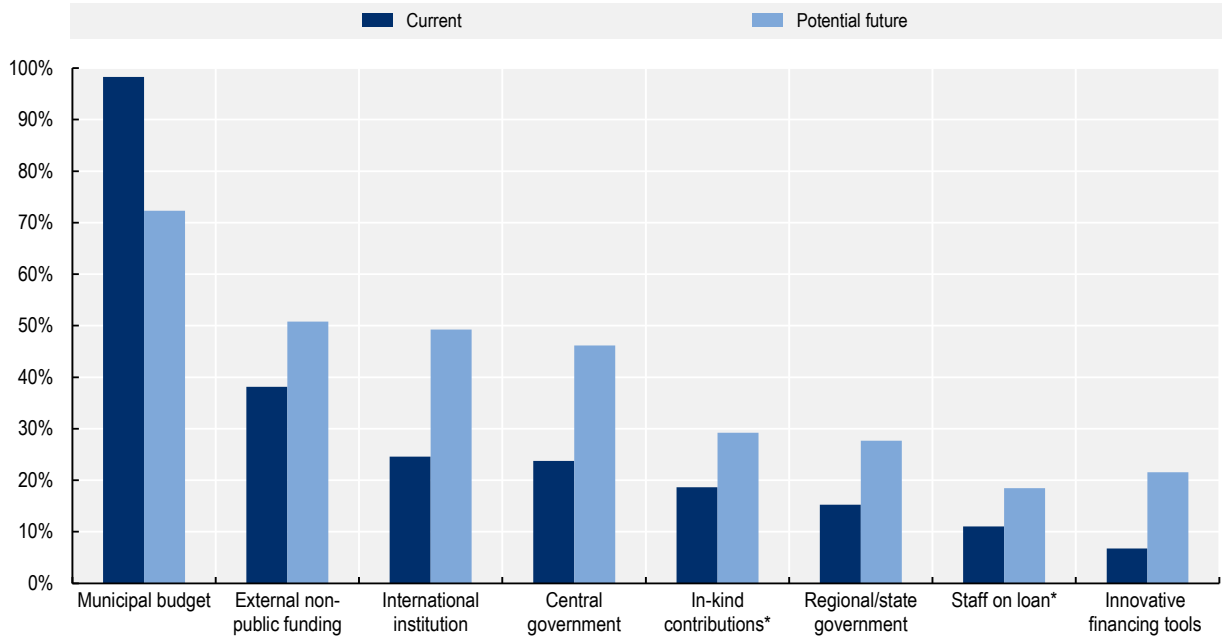
Source: Gascó (2017[23]), *Living labs: Implementing open innovation in the public sector*, http://dx.doi.org/10.1016/j.giq.2016.09.003.

Cities currently rely heavily on self-funding for innovation, but are set to diversify

More than 80% of surveyed cities report funding available in the municipal budget to support innovation capacity. Meanwhile, only seven of 25 OECD countries surveyed in a 2017 OECD report ([25]) listed "sub-national public organisations" among the intended users of central/federal innovation funds. As this data and the Cornellà example (Box 2.7) suggest, cities aiming to innovate may have historically needed to rely more on self-funding than on support from higher levels of government, while cobbling together gap funding from other sources. As Figure 2.13 shows, nearly 100% of surveyed cities report using their municipal budget to fund innovation, compared to just 39% from both regional/state and central governments combined. More cities report receiving funding from non-public sources and international institutions than from their own central governments. Taken together, these insights suggest that, while public sector innovation at the local level is a priority for city governments, it may not be for central or regional ones.

However, Figure 2.13 also demonstrates that this trend might soon shift. While cities still plan to rely more on municipal funding for innovation than any other source, there is a sizeable increase in the number of cities expecting to source funding from other actors compared to current rates. Proportionately, roughly 25% more cities plan to receive funding from international institutions and central governments in the future than do currently. Meanwhile, 26% fewer cities plan to source funding from their city budgets in the future. This diversification of funding sources for innovation could lighten the burden on cities and increase sustainability. Though funding such as one-time grants from philanthropies is not dependable over the long term, a wider distribution of sources means that no single entity can jeopardise a city's innovation budget in light of unforeseen circumstances like COVID-19.

Figure 2.13. Cities rely heavily on municipal budgets for innovation, but plan to diversify funding



Note: Chart represents 118 cities' responses to Survey Question 3.2, "From where does your funding to enhance your capacity to innovate originate?" as well as 65 cities' responses to Question 3.8, "From where will your funding to enhance capacity to innovate potentially originate?"
*Refers to non-financial forms of resource support, including staff, space, or materials.
Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

Support from higher levels of government and international institutions differs by region

Regional context appears to play a role in cities' funding plans. For example, while 88% of surveyed European cities plan to receive innovation funding from international institutions, no US cities expect the same. This is likely due to the strong presence among member countries of international organisations like the European Union in policy making. Such heightened engagement with international institutions may have other benefits, such as horizontal policy transfer between cities. The same may be true for initiatives originating from H2020 and the European Commission as well.

Notably, just 11% of US cities expect to receive innovation funding from the central (federal) government, compared to 63% of European cities. Even at the regional/state government level, which is typically more robust in the US, just 16% of US cities expect funding from this source, compared to 38% of European cities. Meanwhile, US cities employ innovative financing tools to fund innovation at a slightly higher rate than their European counterparts, but not enough to compensate for the lack of funding from higher levels of government.

These discrepancies may partly explain why 74% of US cities use municipal funding for innovation, compared to 67% of European cities. The implication seems to be that the more cities diversify their funding sources, including from international institutions and higher levels of government, the less cash-strapped cities must contribute directly. This could provide a basis for cities to lobby for more funding from the various sources mentioned in Figure 2.13.

Likewise, regional/state and central/federal governments might benefit downstream by providing cities with "seed funding" that augments their innovation budgets. Such investment from higher levels of government could increase and sustain cities' innovation capacity, improving residents' well-being in urban areas that, in most cases, are regions' and countries' main economic engines and population centres.

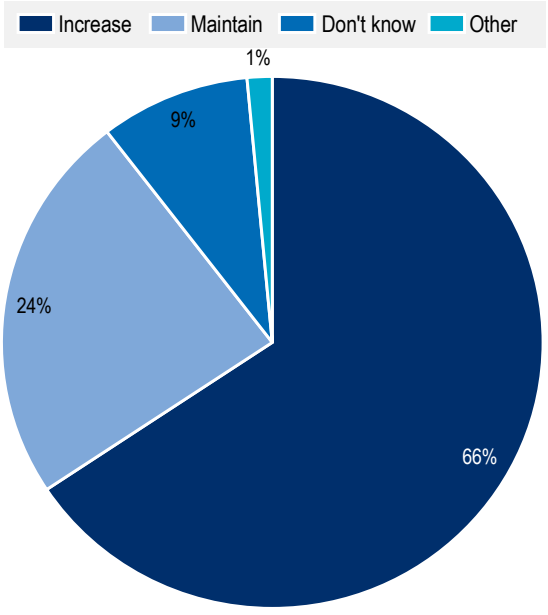
Cities plan to increase their innovation budgets, but may shift their focus

It appears that cities find setting funding aside for innovation to be worth the investment. According to Figure 2.14, two-thirds of surveyed cities plan to increase their innovation budgets, while another quarter plan to maintain existing amounts. Just as revealing, *no* cities plan to decrease their innovation budgets.

While these responses were collected pre-COVID-19, a limited subset of cities responded to a follow-up question about how the pandemic might impact their innovation budgets. All 70 cities that had responded to the 2020 version of the survey were asked if their innovation budget plans (reflected in Figure 2.14) had changed in light of COVID-19. Of these, only 18 (25%) responded. Of the 18 cities, 16 affirmed their intention to increase or maintain their innovation budget plans, citing innovation as a pivotal tool in combatting pandemic fallout. No cities suggested that their innovation budgets would decrease due to COVID-19. While this is a small and non-representative sample, the responses might reflect how cities view the role of innovation activity in relation to COVID-19 recovery.

Figure 2.14. Two-thirds of cities plan to increase their innovation budget (pre-COVID-19)

What are your innovation budget plans for the next 2-3 years?

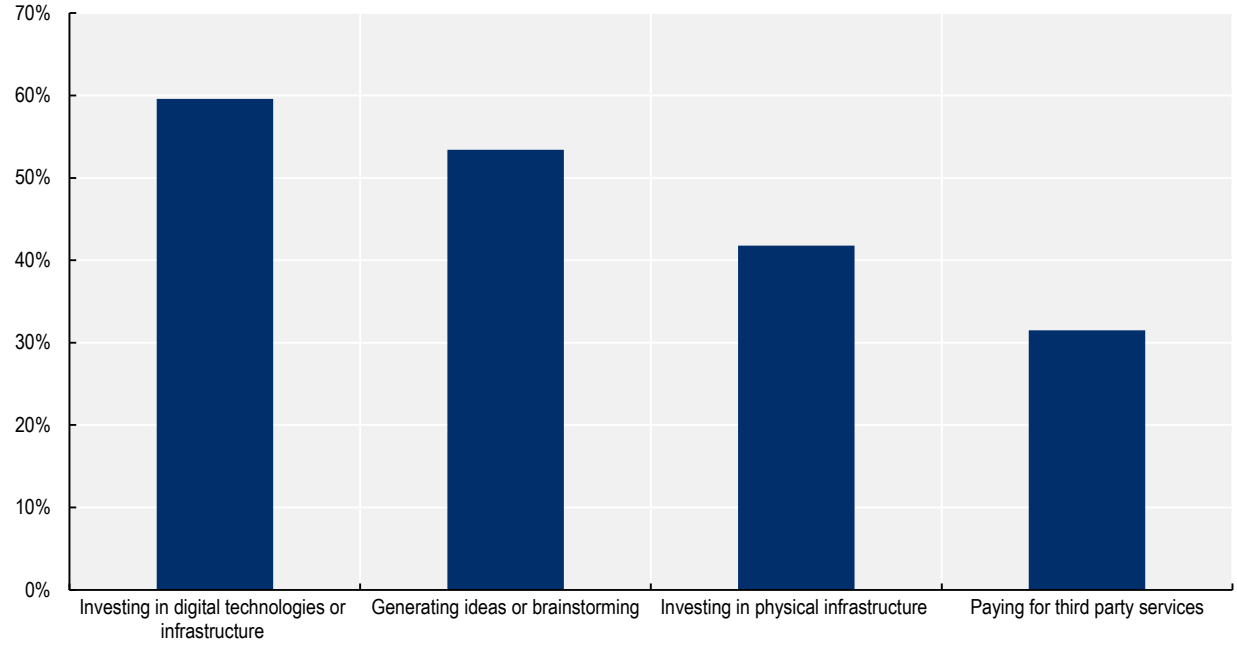


Note: Chart represents 67 cities' responses to Survey Question 3.5, "What are your innovation budget plans for the next 2-3 years?"
Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

While most cities expressed plans to increase their innovation budgets pre-COVID-19, some might shift the focus of their spending. As discussed previously, some cities appear to be preparing to transition their innovation budgets away from strategy and staffing components toward data work and evaluating the outcomes of innovation. As for the types of activities funded by cities' innovation budgets, cities are investing in digital systems, technologies, and/or infrastructure more than any other category (Figure 2.15). However, this trend could be disrupted by COVID-19: some cities could increase innovation budgets in order to digitalise internal operations and public service delivery, while others might have to cut less tangible budget items like innovation in favour of emergency expenses. Most cities are also spending innovation funds on generating ideas and brainstorming, which could include approaches like co-creation,

innovation labs, and human-centred design, but these types of interventions – which usually include a public meeting component – might need to take new forms in light of social distancing.

Figure 2.15. Most cities spend their innovation budgets on digitalisation and brainstorming



Note: Chart represents 146 cities' responses to Survey Question 3.4, "What types of activities are being funded by resources earmarked for innovation?"
Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

Data use can inform strategy, guide funding decisions, and evaluate goals for innovation

Public sector innovation has already gained attention for some time, and need not be rooted in technology or data to have an impact. While "some data-driven ideas are substantive…others are bright, shiny objects" (Goldsmith and Kleiman, 2017[17]). However, discussion of public sector innovation has shifted to an increased focus on data's ability to enable novel types of innovation (Janssen et al., 2017[1]). According to the OECD (2015[27]), "better access to and use of public sector data can lead to important value creation from economic, social, and good governance perspectives". The increasing role of data in public sector decision making, including around innovation, is accelerated by three socio-economic and technological trends: (1) the growing capacity for data generation and collection, (2) the power of data analytics and (3) the emergence of a paradigm shift in knowledge creation and decision making (OECD, 2015[27]).

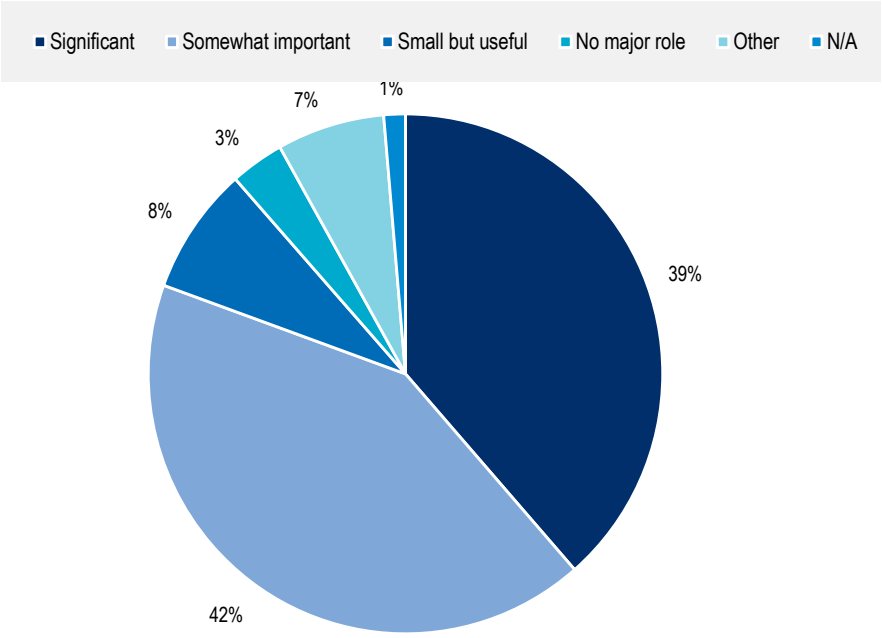
Janssen et al. (2017[1]) state that data-driven innovation can "result in a dramatic transformation of public sector systems and can create societal benefits", with data playing a "pivotal role" in public sector innovation. These societal benefits could include less pollution, fewer traffic jams, improved tracking of disease outbreaks, greater energy efficiency, new agricultural services, a transformation of residents' online interactions with government, and lower service delivery and governing costs. The public sector's ability to leverage data-driven innovation to these ends depends on four capabilities of the data cycle, resulting in innovative and action-oriented decision making: (1) collecting data, (2) opening and sharing data, (3) combining data (e.g. ensuring compatibility) and (4) analysing data for new insights and applications (Janssen et al., 2017[1]).

Thus, while innovation is possible without data, building data capacity can help cities innovate in more cost-efficient and targeted ways for greater impact.

Data use is widespread, but many cities lack the capacity to fully benefit

A vast majority of surveyed cities report that data plays either a "Significant" or "Somewhat important" role in their innovation efforts and decision making (Figure 2.16). This role could be establising measurable innovation goals and the evaluation of outcomes against those goals, guiding the reallocation of staff to programmes that under-perform or serve high-needs populations, or informing the adjusting budget allocations based on priorities and performance. Several surveyed cities report being somewhere in the process of building capacity to use data in these ways, as well as to guide conventional policy decisions, address community concerns and facilitate civic engagement.

Figure 2.16. Data plays an important role in many cities' innovation efforts and decision making



Note: Chart represents 147 cities' responses to Survey Question 4.1, "How significant a role does data play in your city's innovation efforts and decision making?"
Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

However, while most cities report that data plays a significant or somewhat important role in their innovation efforts and decision making, fewer than half report using data to align their budget process with strategic priorities. Though not directly related to using data for innovation, this suggests that cities still have far to go before data-driven decision making, monitoring and evaluation become second nature.

Box 2.8. How cities use data for innovation or are building the capacity to do so

The city website of **Bologna, Italy,** allows citizens to create personal blogs, vote for participatory budgeting, propose projects, make collaboration pacts (agreed-upon projects between the city and residents) and access the city's open data. The participatory budgeting dossiers provided support resident engagement in the decision process, with data related to the proposal presented in an understandable and easy to access format.

Montgomery, AL, United States, crafted a program tapping into data from various sources, including utility partners and housing codes, to better identify and prevent blighted and abandoned properties.

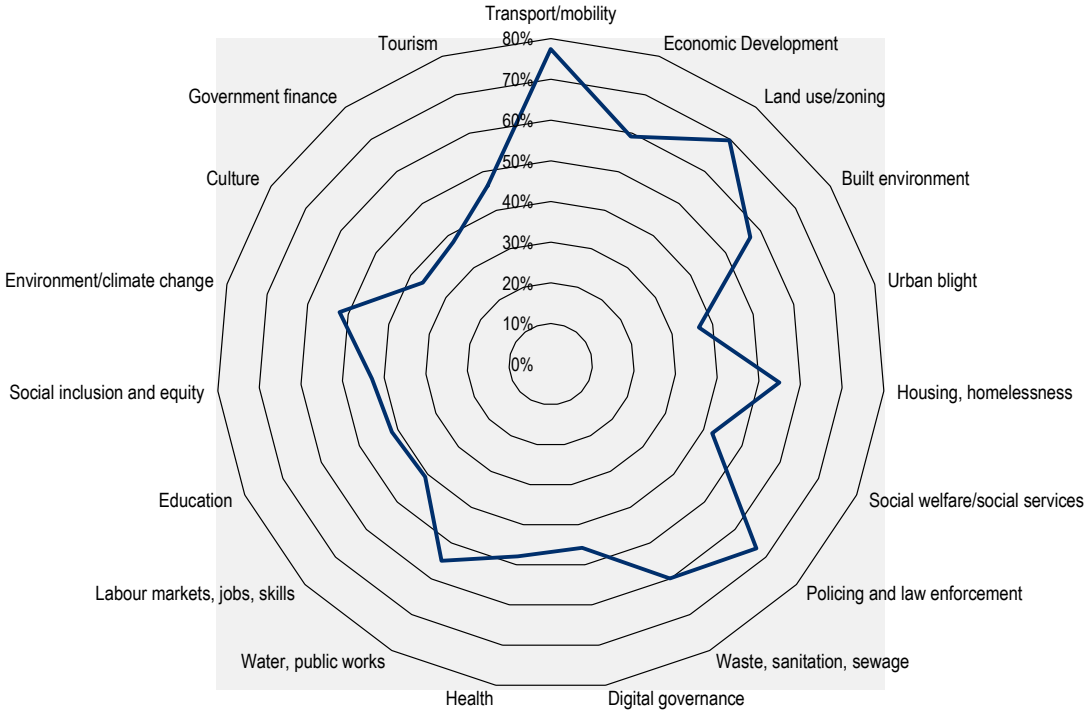
The City Council of **Bristol, United Kingdom,** uses "a wide range of data and information" related to the city's population and geography "as evidence on which to base its plans and policies."

Bloomington, IN, United States, is "in the process of identifying data that describes the operations of each department and initiative as well as the impact of innovations in departments or topic areas."

Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

In fact, the problem does not seem to be access to data, but rather that cities must build sufficient capacity in both innovation and data use to deploy the data they already possess. As discussed below, in the section "Evaluating outcomes can create feedback loops that lead to greater impact", more surveyed cities report having "Sufficient data" in several sectors to advance innovation work than report applying innovation to or measuring outcomes in those same sectors. This suggests that while the data is there, cities' capacity to use it may not be. Figure 2.17 shows what percentage of cities possess "Sufficient" data in numerous policy areas to advance their innovation work. While there are disparities, for instance in the percentage of cities with data on transport versus urban blight, it is encouraging that at least 37% of cities report sufficient data for innovation in all 19 sectors.

Figure 2.17. Data availability for innovation varies considerably by sector



Note: Chart represents 142 cities' responses to Survey Question 4.3 "Does your city have sufficient or insufficient data in the following areas to advance your innovation work?"
Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

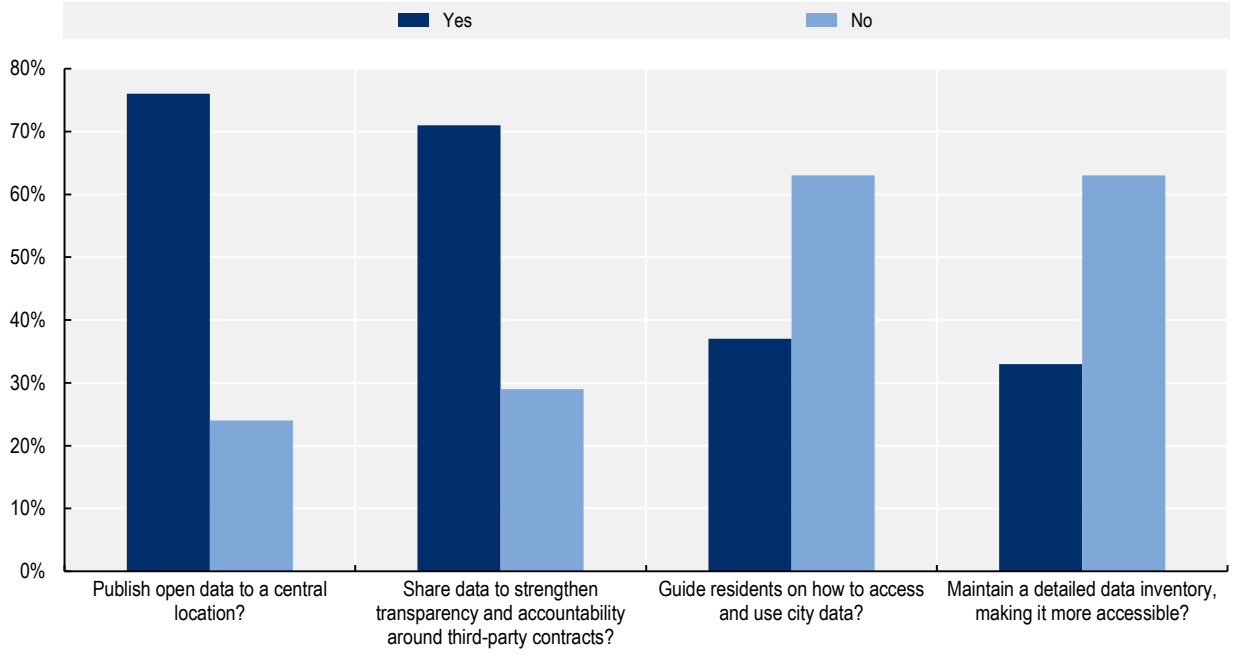
Data capacity building is uneven

As referenced above, Janssen et al. (2017[1]) detail four capabilities of the data cycle that public sector organisations must possess to benefit from data-driven innovation – collecting data, opening and sharing data, combining data (e.g. ensuring compatibility), and analysing data for new insights and applications – resulting in innovative and action-oriented decision making.

Though not the exact same factors, the OECD/Bloomberg Survey asked cities to report on their data capacity in similar areas: data inventory, publishing open data, guiding residents on how to access and use city data, and sharing data to increase transparency, accountability, and competitiveness relative to contract bids. As shown in Figure 2.18, most cities publish open data to online portals for public use and share data to enhance the transparency of city contracts. This is significant, considering that "public data is a powerful asset to move from citizen-centred to citizen-driven approaches, allowing governments to better design and tailor public service delivery processes" (OECD, 2017[25]).

However, fewer cities provide guidance to residents to both access and make use of city data. While making data open and sharing data on city contracts is a step toward transparency, not training residents to engage with this data limits its utility. Providing residents guidance in using a city's open data could increase resident engagement and support co-creation. Cities may want to focus on bolstering this aspect of data capacity for innovation.

Figure 2.18. Cities are opening and sharing data, but not guiding residents or keeping inventory



Note: Chart represents 82 cities' responses to Survey Questions 4.4-4.7. For more detail, see the Survey in Annex B.
Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

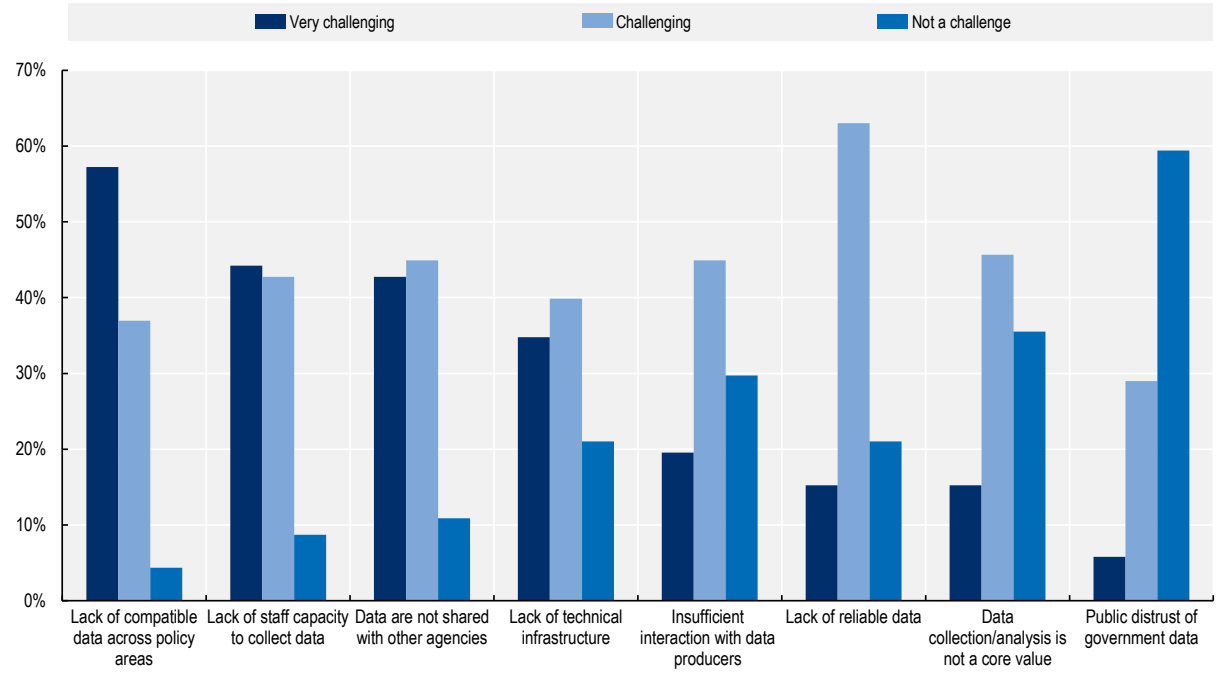
In addition, just 31% of cities report maintaining a detailed data inventory. Chattanooga, TN, United States, provides an example of how doing so can benefit cities:

> *Chattanooga has worked hard to automate our data collection, cleaning and posting in order to reduce the barrier of entry for data driven decisions. This makes for a more sustainable data program. Now that the system is up and running we are learning the importance of maintenance to keep our data extract, transform (ETL) and loads jobs working. We created a data health dashboard to assist us with these efforts.*

While Chattanooga made strides in developing its data capacity, other cities encounter obstacles in various areas. Edmonton, Canada, reports that its city "is held back by a heavy demand on skilled staff to analyse or understand these data…often we have massive datasets and inadequate amount of time to reflect, process, analyse, and make sense of all the information." This observation underscores the interdependence of the innovation components.

Meanwhile, Helsinki, Finland, explains that it has "a lot of data but it is very fragmented in many different systems," and that privacy laws like GDPR limit possibilities to combine data. However, Helsinki is finalising its data strategy to clarify how data is used and its plans for collection, analytics, and honouring privacy. These difficulties are broadly consistent with what surveyed cities report as most challenging regarding the use of data to reach innovation goals (Figure 2.19).

Figure 2.19. Data compatibility and collection are the biggest challenges to data use



Note: Chart represents 138 cities' responses to Survey Question 4.8, "Which factors are the most challenging and prevent your municipality from optimising its use of data to support innovation goals?" For more detail, see the Survey in Annex B.
Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

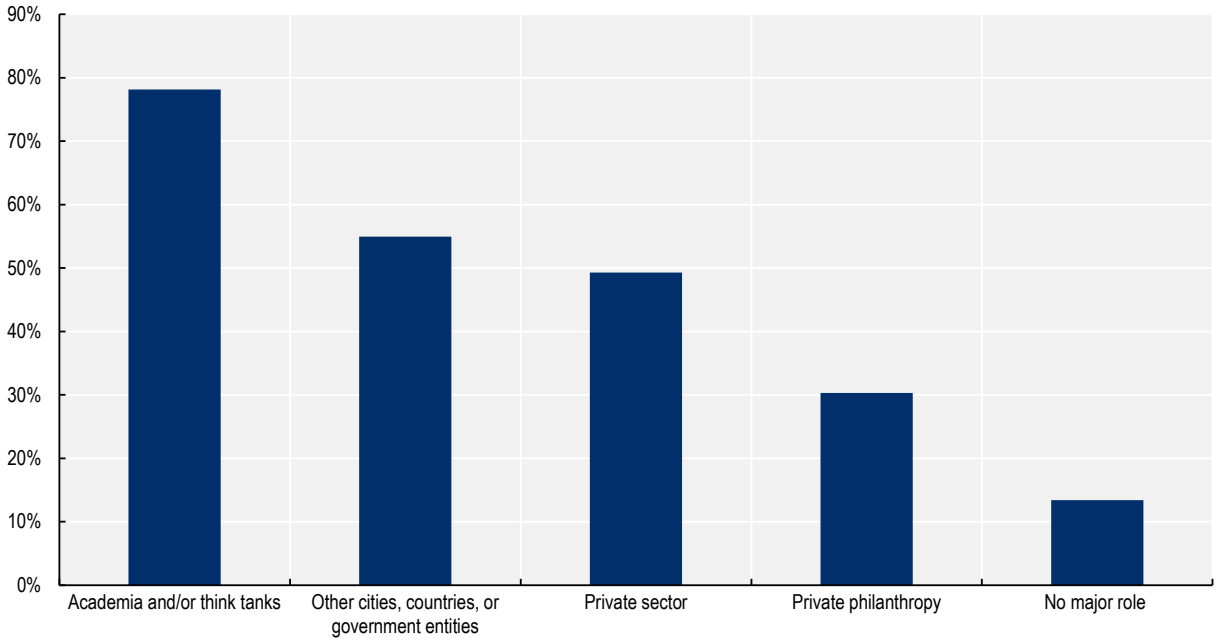
Partnerships can fill the data capacity gaps

Despite, or perhaps because of, Helsinki's struggles to benefit from data use for innovation, the city pursues "cross sector research projects with academia," including combining health and environmental data as part of its research. Just as partnerships can be effective to increase cities' innovation capacity in general, strategic data partnerships present an opportunity for cities to fill gaps in their data capacity for innovation and leverage outside expertise to gain valuable insights.

As Figure 2.20 shows, most cities take advantage of partnerships to increase their data capacity for innovation. Not only can cities benefit by drawing on external organisations' skills and resources to collect, clean, combine, maintain and analyse data, they can also benefit from knowledge spill-over as a result of collaboration. Thus, partnerships can not only enhance cities' data capacity but can also inject new skills and a newfound culture of innovation into city operations.

Other times, such collaborations can spread new skills and data culture to the broader community. For example, Wichita, KS, United States, partnered with nearby Wichita State University to define, organise and structure its data while building data expertise among the university's students.

Figure 2.20. Most cities partner with academia, think tanks, and/or other public entities on data



Note: Chart represents 142 cities' responses to Survey Question 4.9, "Has your municipality developed any partnerships with the aim of collecting or analysing data to fuel innovation capacity or strategy?" For more detail, see the Survey in Annex B.
Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

Evaluating outcomes can create feedback loops that lead to greater impact

To discern the true impact of public sector innovation and the value it creates for residents, cities must monitor and evaluate innovation outcomes. Evaluating innovation outcomes can allow cities to make improvements quickly and continuously throughout implementation, ultimately yielding a greater impact on residents' well-being. Indeed, case studies reveal preliminary evidence of a "positive link" between public sector innovation and public service performance that can improve residents' lives (Salge and Vera, 2012[6]).

However, while recent years have brought an increased interest in "measuring public sector innovation in ways that are…useful in policy making and evaluation contexts," efforts to do so have "brought out more problems than answers" (Kattel et al., 2013[28]). Though case studies and success stories can shed light on innovation's impacts on residents' well-being, research is still rather "anecdotal and limited to specific sectors or individual countries" (UNECE, 2017[29]). Comparative evaluations of public sector innovation in particular "should be used with extreme caution" (Kattel et al., 2013[28]). The dearth in evaluation of outcomes leaves a "significant gap which prevents the analysis and understanding of [public sector] innovation" (Gault, 2018[13]), undermining innovation efforts around "health, the environment and a range of other policy objectives that are related to well-being" (OECD, 2015[16]).

Evaluation refers to the "systematic and objective assessment of an ongoing or completed project, programme or policy, its design, implementation and results" (OECD, 2011[30]). Evaluation of public sector innovation allows practitioners to compare outcomes to stated goals, and provides insights to inform future decision making for innovation budgets, programming and priorities. The evaluation process also offers a form of "oversight and accountability from which public sector innovation cannot escape", providing cities the capacity to demonstrate the tangible value of innovation to residents—or otherwise, to cut spending on programmes that yield no benefit (OECD, forthcoming[31]).

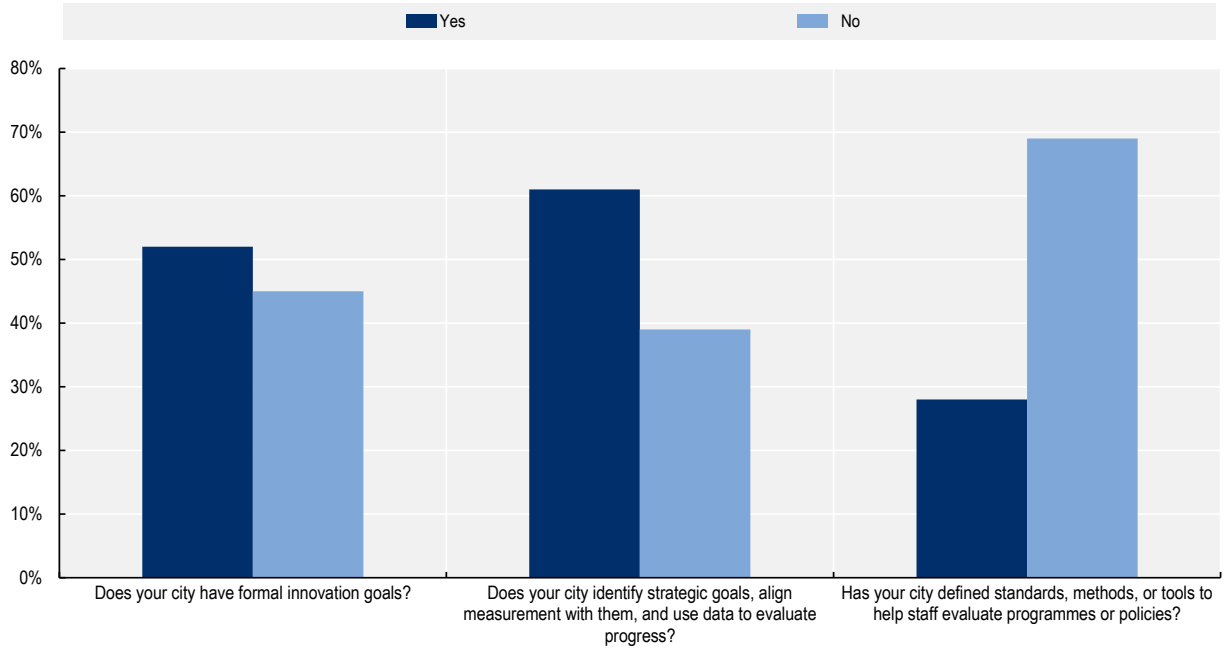
Evaluating public sector innovation's impact on well-being could be necessary to secure sustained funding and political support to scale up a pilot project. The absence of quantifiable evidence around public sector innovation outcomes makes it harder for cities to build trust, secure long-term funding, and scale up successful programmes for greater impact. Even in countries "where an evidence culture is relatively strong, the role of monitoring, evaluation, and learning in innovation is weak" (OECD, 2020[14]). Thus, evaluating public sector innovation is crucial for cities to prove whether residents truly benefit from innovation, and to transition successful pilots to permanent and sustainable programmes. However, while innovation is everywhere today, "there is not yet a culture of evidence-based innovation—evaluation and evidence are often absent" (OECD, 2020[14]).

Many cities are not yet measuring innovation activity, but may be on their way

As discussed in the section on innovation strategy, above, defining innovation, establishing a coherent strategy, and setting goals are prerequisites to evaluating public sector innovation activity. Thus, it is encouraging that most cities report having formal innovation goals and broader strategic goals with which they align a diverse set of measures and use data to evaluate progress (Figure 2.21).

However, while setting goals for innovation is a prerequisite to measuring outcomes, doing so does not guarantee that cities also possess a system for evaluation. While a slim majority of surveyed cities report having formal innovation goals, fewer than 30% report having defined standards, methodologies or tools to help staff evaluate innovation activity (Figure 2.21). A measurable goal for innovation might be reducing the administrative process to start a business by a certain number of days or seeing a certain increase in the percentage of daily connections to the city's public Wi-Fi.

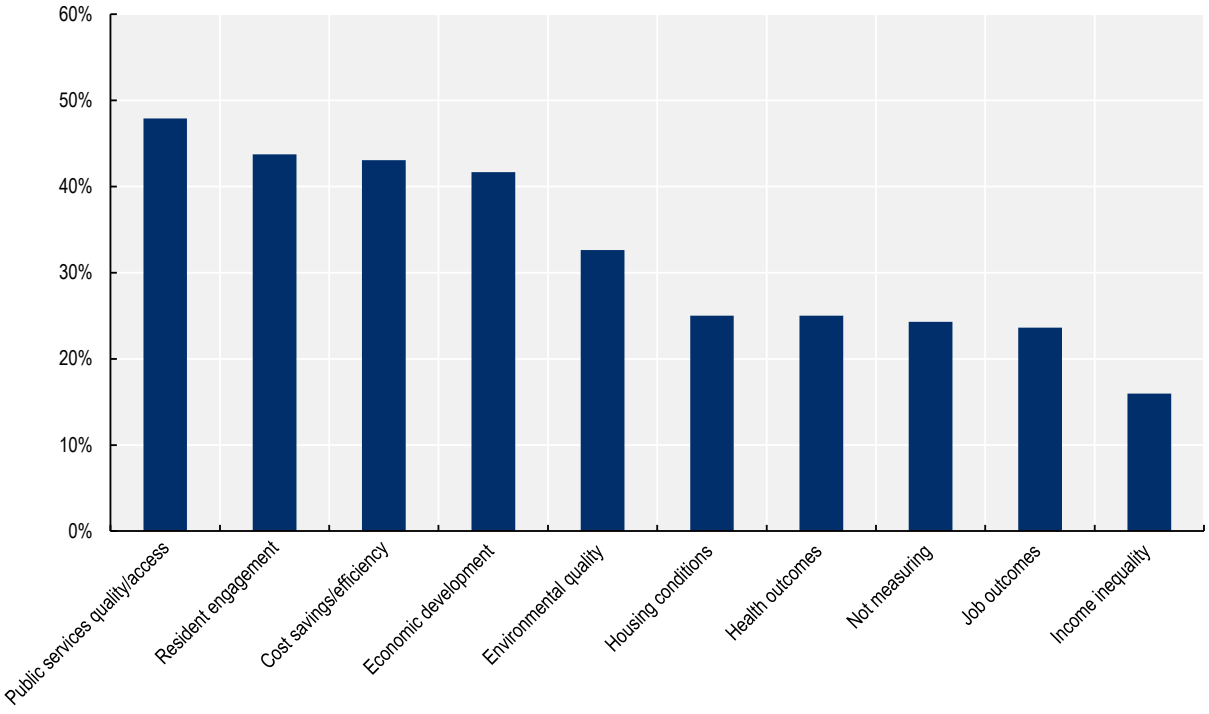
Figure 2.21. Most cities have goals for innovation and strategy, but not robust evaluative tools



Note: Chart represents 83 cities' responses to Survey Question 5.1, "Does your city identify strategic goals, align a diverse set of measures with those goals and use data to evaluate progress toward them?"; 144 cities' responses to Survey Question 5.2, "Does your city have formal innovation goals?"; and 83 cities' responses to Survey Question 5.5, "Has your city defined standards, methodologies, or tools to help staff rigorously evaluate practices, programmes, and/or policies?" For more detail, see the Survey in Annex B.
Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

Cities fail to measure outcomes in crucial policy sectors. The three outcomes that cities measure most correlate with the three main types of value that public sector innovation can generate for city residents (Figure 2.22 and Box 2.1): public service delivery, resident engagement and efficiency of internal government operations. Measurement in these areas bodes well for cities developing valuable data insights into key innovation activities, which can be used to assess and refine programmes and priorities so that they create value for residents.

Figure 2.22. Nearly half of cities measure public service outcomes, but sectoral indicators lag

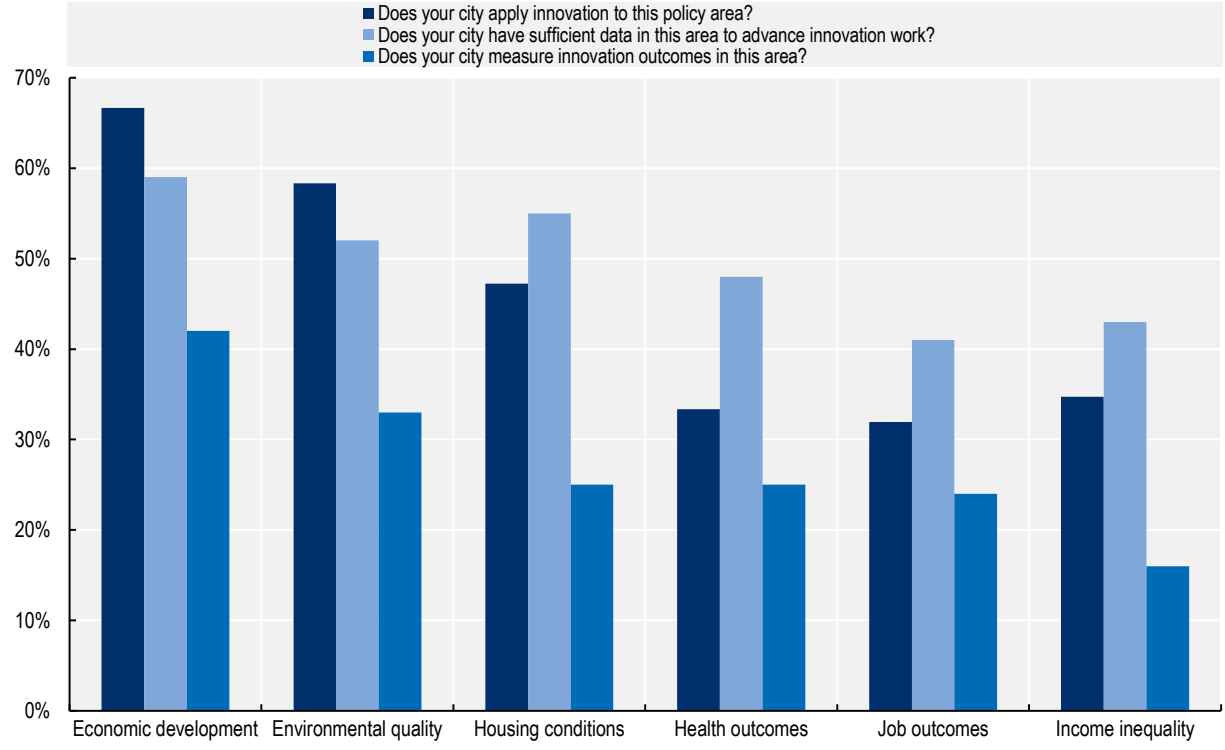


Note: Chart represents 144 cities' responses to Survey Question 5.7, "What specific outcomes are you measuring to determine whether innovation efforts in your city are effective?"
Source: OECD/Bloomberg (2018-20), Philanthropies Survey on Innovation Capacity in Cities.

However, upon further inspection, cities do not appear to measure innovation outcomes enough. No outcome is measured by a majority of cities: 24% of cities report not measuring outcomes at all, and sector-specific outcomes (e.g. environmental quality, housing, jobs) are measured at much lower rates than the three general areas listed above. This represents a missed opportunity for cities, considering that public sector innovation "matters not only for growth but also for health, the environment and a range of other policy objectives that are related to well-being" (OECD, 2015[16]). Public sector innovation can help address societal challenges such as "climate change, demographic pressures, urban congestion and social and economic inequality" (Arundel, Bloch and Ferguson, 2019[2]), but evaluating outcomes is necessary to both demonstrate and increase impact. Without measuring impact in these sectors, cities cannot make informed adjustments to their efforts.

Neither a lack of focus nor a lack of data account for cities' low levels of measurement in specific sectors. As shown in Figure 2.23, cities appear both to apply innovation and have sufficient data for areas like economic development, environmental quality, housing, health, jobs, and income inequality. Despite this, cities measure outcomes in these sectors at a significantly lower rate than they "apply innovation" to or possess "sufficient data" for those same sectors.

Figure 2.23. Cites apply innovation to and have data for sectors, but do not measure impact

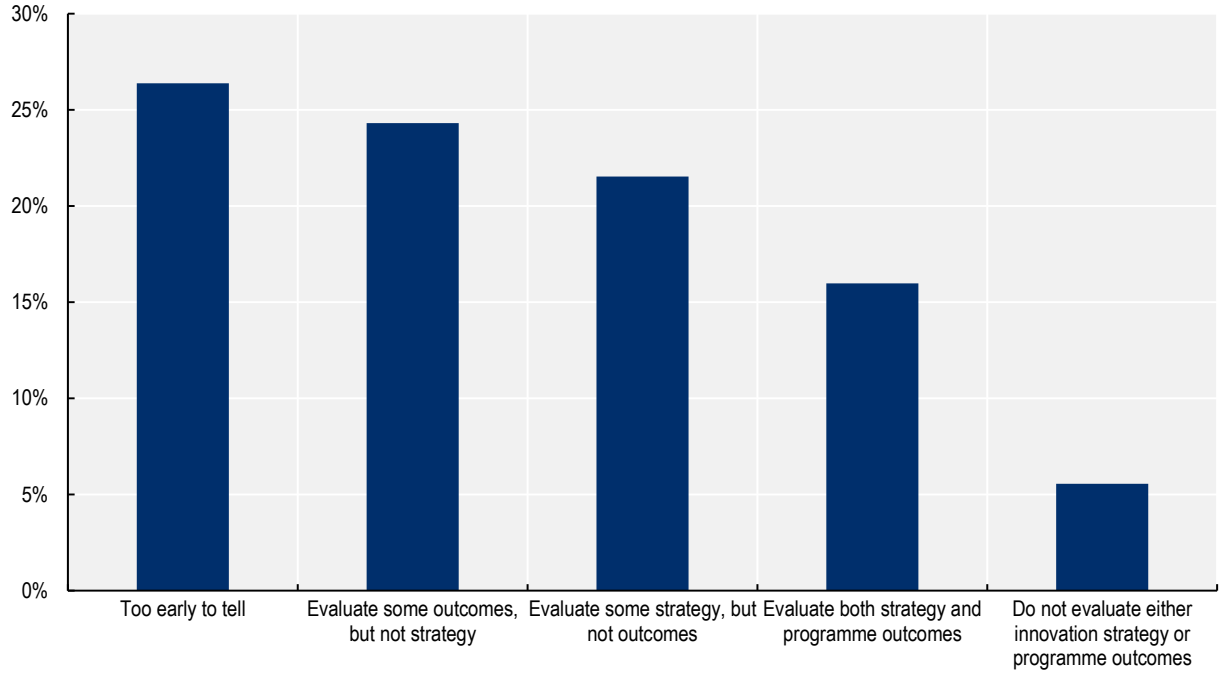


Note: Chart represents 72 cities' responses to Survey Question 1.8, "In which policy areas has your municipality applied innovation?"; 144 cities' responses to Survey Question 5.7, "What specific outcomes are you measuring to determine whether innovation efforts in your city are effective?"; and 142 cities' responses to six of 19 total options for Question 4.3, "Does your city have sufficient or insufficient data in the following areas to advance your innovation work?" The responses above were chosen due to their alignment with responses to Question 5.7.
* The option "income inequality" from Question 5.7 is being compared with option "social inclusion and equity" from Questions 1.8 and 4.3.
Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

This underwhelming level of evaluation is not limited to individual sectors. Of the 127 cities conducting evaluation related to innovation, just 16% report "systematically and comprehensively" evaluating *both* their innovation strategy *and* their innovation programme outcomes (Figure 2.24).

Though these results suggest exceedingly sparse measurement of innovation, there is cause to believe that cities are trending toward more robust evaluation. The survey results shown in Figure 2.24 show that few cities still do not evaluate either innovation strategy or outcomes. Nearly two-thirds of surveyed cities report measuring some mix of innovation outcomes and/or strategy. While it is still "Too early to tell" for 38 cities (over one-quarter of respondents), this might imply that these cities are simply early in the process of constructing mechanisms to evaluate their innovation activity.

Figure 2.24. Most cities evaluate somewhat, but it's too early for many to determine impact



Note: Chart represents 144 cities' responses to Survey Question 5.6, "Does your municipality undertake a systematic assessment or evaluation of the impact of your innovation strategy?"
Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

Evaluation capacity correlates to innovation programme maturity

Cities' struggles to build evaluation capacity may stem from the relative newness of their innovation teams and initiatives. As captured in the discussion of Figure 2.11, cities broadly appear to first establish strategies and teams for innovation, then pivot toward data use and evaluation. This is likely because an innovation strategy and team are the foundations of any broader innovation effort: without a strategy, there are no stated goals to evaluate, and without a team, there is no one to execute data analysis.

This notion is supported by the correlation between the length of time a city's innovation team exists and the robustness of its evaluation practices (Table 2.2). Cities that have innovation teams for longer report evaluating innovation outcomes and/or strategy at a higher rate than cities with newer teams. Conversely, cities with newer innovation teams report not evaluating innovation or not having an innovation strategy at all at a higher rate than cities with older teams. Also telling, cities with innovation teams more than five years old responded the least that it's "too early to tell" whether they evaluate the impact of their innovation strategy. This suggests that evaluation increases as cities' capacity for innovation deepens. It also suggests that cities with newer innovation teams that answered "too early to tell" may nonetheless be on their way to evaluating innovation outcomes.

Table 2.2. Cities with older innovation teams evaluate outcomes and/or strategies more

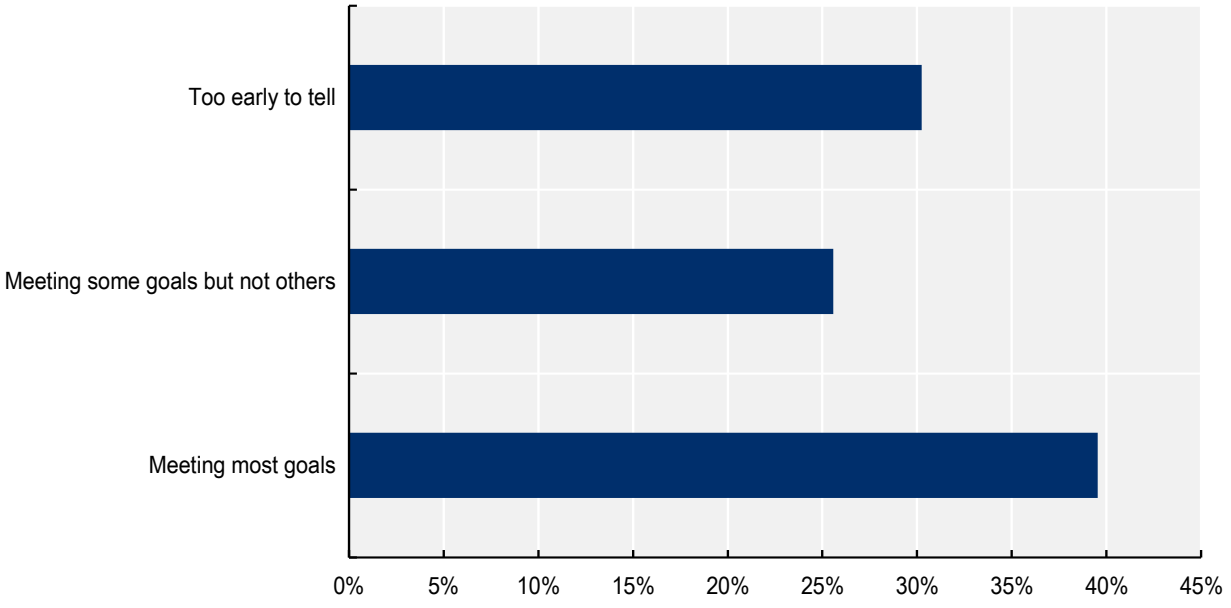
How long an innovation team has existed	More than 5 years	3-5 years	1-3 years	Less than 1 year
Number of cities	46	37	31	12
Evaluate innovation outcomes and/or strategy	78%	62%	48%	42%
Too early to tell	13%	30%	35%	17%
Do NOT evaluate innovation outcomes or strategy	2%	5%	6%	17%
Do NOT have an innovation strategy	0%	3%	6%	25%
Other	7%	0%	3%	0%

Note: Chart represents 140 cities' responses to Survey Question 5.6, "Does your municipality undertake a systematic assessment or evaluation of the impact of your innovation strategy?" as well as 130 cities' responses to Survey Question 2.9, "How long has an Innovation team existed?" Four cities responded to Question 5.6 "Don't know", which are not included in this chart.
Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

Formal innovation goals facilitate evaluation and successful implementation

Though there is room for improvement in cities' efforts to measure and evaluate innovation outcomes, and though nearly half of surveyed cities lack the formal innovation goals necessary to evaluate outcomes, most cities with formal innovation goals report meeting them (Figure 2.25). This should motivate other cities to establish formal innovation goals and put a system in place to measure those outcomes.

Figure 2.25. Most cities that set and evaluate formal innovation goals report meeting them



Note: Chart represents 86 cities' responses to Survey Question 5.3, "How would you say that your city is doing with regards to meeting its stated innovation goals?" Four cities answered "other", not shown.
Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

Cities must build their capacity to evaluate outcomes so that they make use of available data and funding spent on innovation. Based on evaluation efforts in relation to the maturity of innovation teams, it seems that evaluative practices increase the longer cities undertake innovation. It also appears that most cities that set formal innovation goals meet them. While this appears positive, cities might need to increase their emphasis on measurement so that administrations–and residents–fully reap the benefits of public sector innovation. Increased measurement of outcomes in specific sectors could be necessary.

Patterns in local public sector innovation and residents' well-being outcomes

This section provides evidence on whether and through what channels public sector innovation capacity in cities links to residents' well-being outcomes. Although literature on public sector innovation grew in recent years, little research exists linking local innovation capacity with well-being outcomes for city residents. The few studies that explore those links rely on limited sets of well-being measures, and mainly anecdotal (UNECE, 2017[29]) or self-reported information (Arundel, Casali and Hollanders, 2015[7]). Additionally, most studies focus on an individual area, country or city, lacking a broader international perspective. The analysis presented in this section contributes to filling this gap by using a set of comparable objective and subjective well-being indicators for 112 US and European cities.

The assessment builds on the OECD well-being framework for regions and cities (Figure 1.1) and on the OECD/Bloomberg Survey on Innovation Capacity in Cities carried out in 2018 and 2020 (Box 1.1). The OECD/Bloomberg survey identifies five components of public sector innovation capacity: Innovation strategy, Innovation staffing, Funding for innovation, Data for innovation, and Innovation outcomes evaluation. A selection of questions that capture the essence of these components are combined to generate a public sector innovation (PSI) score ranging from 0 to 10, where 10 stands for having all innovation practices adopted by the city (Table 1.3).

This section starts with an overview of well-being outcomes in cities by their level of public sector innovation capacity (PSI score). It then explores links between individual well-being indicators and the different components of public sector innovation capacity, controlling for differences in population and the level of economic development of the city. This ensures that the links between well-being outcomes and the PSI components are statistically significant regardless of how big (or small) and rich (or poor) cities are.

The results reveal robust correlations between PSI components and several well-being outcomes at the city level, including satisfaction with life and with the city, educational attainment, material conditions, walkability, air pollution and crime rates. While these links do not prove causality from PSI capacity to well-being outcomes, they reveal that public sector innovation capacity tends to go hand in hand with improvements in well-being.

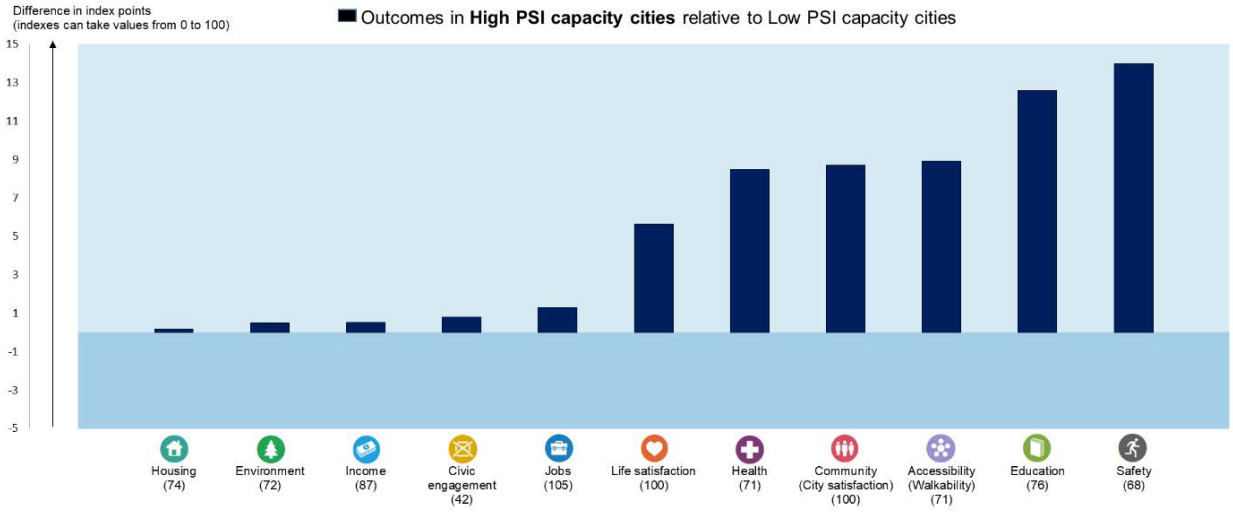
How is life in cities with high public sector innovation capacity?

Life is better in cities with high public sector innovation capacity, on average. Applying the OECD methodology to measure and compare well-being outcomes across regions and cities, Figure 2.26 shows the difference for each well-being index (normalised scores from 0 to 100, see Annex 1.C) between cities with high (PSI score from 6 to 10) and low (PSI score from 0 to 5) innovation capacity.

While outcomes are better in cities with high PSI capacity in all 11 well-being dimensions, the differences are particularly large (above 5 points) in six of these: access to services, education, health, safety, city satisfaction, and life satisfaction. Looking directly at the indicators that compose each index, results show that cities with higher public sector innovation are characterised, on average, by higher walkability, tertiary educational attainment, life expectancy, self-reported health, life and city satisfaction, as well as lower crime (Figure 2.27).

Figure 2.26. Public sector innovation and well-being in cities: Indexes

Difference between indexes ranging from 0 to 100, where 100 is the best outcome; unweighted averages of cities



Note: High PSI capacity cities: scores from 6 to 10; Low PSI capacity cities: scores from 0 to 5. Indicators included in the indexes by well-being dimension are listed in Table 1.1. Number of cities in parentheses.
Sources: American Community Survey; Gallup US Daily 2016-17; NYU Langone Health and NYU Wagner City Health Dashboard; Reflective Democracy Campaign; and OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

Figure 2.27. Public sector innovation and well-being in cities: Headline indicators

	Low PSI (0 to 5)	High PSI (6 to 10)
Jobs		
Employment rate (%)	71.0	72.0
Unemployment rate (%)	7.2	7.1
Income		
Income deviation from national average (%)	5.3	6.0
Housing		
Households spending less than 25% of their income on rent (%)	79.7	79.7
Access to services		
Walkability index	45.9	51.8
Education		
Population with tertiary education (%)	33.7	41.5
Civic engagement		
Voter turnout in local elections (%)	28.2	28.6
Health		
Life expectancy at birth (years)	77.9	78.6
Population without health problems (%)	78.0	80.4
Environment		
Air pollution, particulate matter (micrograms per cubic metre)	8.7	8.7
Safety		
Violent crime rate (number of crimes per 100 000 people)	856	591
Community		
Population satisfied with the city (%)	81.7	85.7
Life satisfaction		
Population satisfied or very satisfied with their life (%)	79.4	81.4

Note: The Walkability Index reflects the accessibility of various neighbourhood amenities by walking. The metric ranges from 0 to 100. Values below 50 indicate that most daily errands require a car.
Sources: American Community Survey; Gallup US Daily 2016-17; City Health Dashboard; Reflective Democracy Campaign; and OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

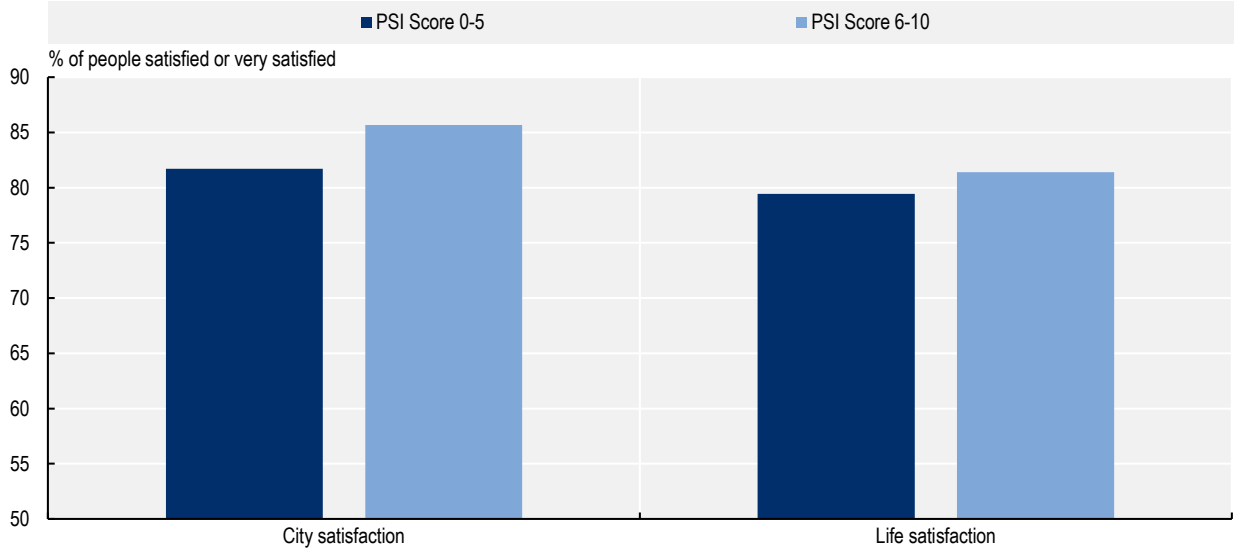
While these results help understand well-being conditions in cities, they depict only statistical associations and not the direction of effects between public sector innovation and well-being outcomes. For example, while higher PSI capacity might lead to better well-being results (e.g. higher civic engagement), certain city well-being conditions (e.g. the share of population with tertiary education) could be among the drivers of higher innovation capacity in the public sector. Another aspect to keep in mind is that unobservable characteristics such as population size and economic development (city income with respect to average income of the country) could influence both PSI capacity and well-being outcomes. For this reason, the following sections go beyond descriptive statistics and highlight associations that hold even when controlling for population and economic development of cities (see Annex 2.A).

Public sector innovation capacity and residents' well-being outcomes

People in cities with better public sector innovation practices tend to be more satisfied with their city and their life. In cities that participated in the OECD/Bloomberg Survey, the percentage of people satisfied with their city is 86% in cities with high public sector innovation capacity (score from 6 to 10), around 4 percentage points higher than in cities with low public sector innovation capacity (score from 0 to 5) (Figure 2.28).

A similar trend is observed for life satisfaction, which also tends to link to city satisfaction through social support networks and the feeling of belonging to a community (OECD, 2015[32]). In cities with high public sector innovation practices, the percentage of people satisfied or very satisfied with their life is around 81% – 2 percentage points higher than in cities with low public sector innovation practices. While literature linking PSI and subjective well-being indicators is limited, some studies suggest that investments in public sector innovation, for example in e-government tools, can increase civic engagement and political participation, opportunities for previously excluded groups (Feeney and Brown, 2017[33]) and trust in government (Welch, 2004[34]), which are closely related to life and city satisfaction (Boarini and Díaz, 2015[35]).

Figure 2.28. Public sector innovation correlates to satisfaction with the city and life



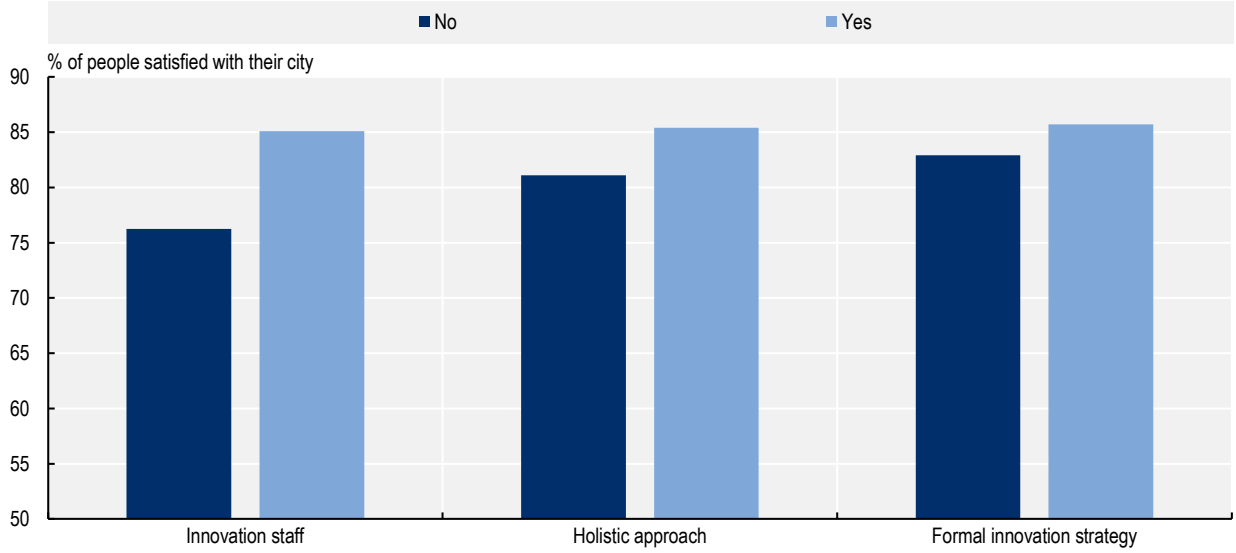
Note: The positive association between having high PSI capacity and city satisfaction persists after controlling for population and the level of economic development of the city.
Sources: Gallup US Daily 2016-17; European Survey of Quality of Life, 2019; and OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

PSI capacity might also have a direct relation with city and life satisfaction through specific PSI features such as stakeholder engagement, transparency and accountability. Residents who feel they have a say in the way their local government works or believe it operates in a transparent manner are more likely to report being satisfied with their city and their life (OECD, 2015[32]). Stakeholder engagement also plays a key role in ensuring the continuity of innovation activities. Research on public sector innovation in Mexican local governments reveals that innovation models that positively affect the fundamental relationships between stakeholders are more likely to survive through government turnover (Díaz Aldret, 2016[8]).

Results from the analysis indicate that, for the same population size and level of development, residents in cities with dedicated innovation staff, a holistic approach to innovation and a formal innovation strategy are more likely to be satisfied with their city (Figure 2.29). A formal innovation strategy implemented by a dedicated innovation staff is key to delivering services more efficiently, to tackle new and complex challenges, and to potentially improve transparency and trust in government (OECD, 2015[16]).

Similarly, the statistical examination showed that cities that go beyond a siloed perspective to integrate a cross-sectoral, multi-level and systemic approach to innovation are more likely to display higher levels of city satisfaction. This finding brings additional support to the qualitative evidence shared by cities like Las Vegas, NV and New Orleans, LA in the United States, whose efforts to foster cross-sectoral interactions (via cross-departmental meetings and centralised performance management) help address challenges by ensuring all departments internalise and work simultaneously towards broader city goals. Another example is New York City's Department of Buildings, whose co-operation with 20 other city agencies led to substantial operational improvements, including more effectiveness in identifying high-risk buildings and more transparency in its processes (OECD, 2015[27]).

Figure 2.29. Public sector innovation and satisfaction with the city, by PSI component



Note: The associations between the different PSI components and city satisfaction persist after controlling for population and the level of economic development of the city.
Sources: Gallup US Daily 2016-17; and OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

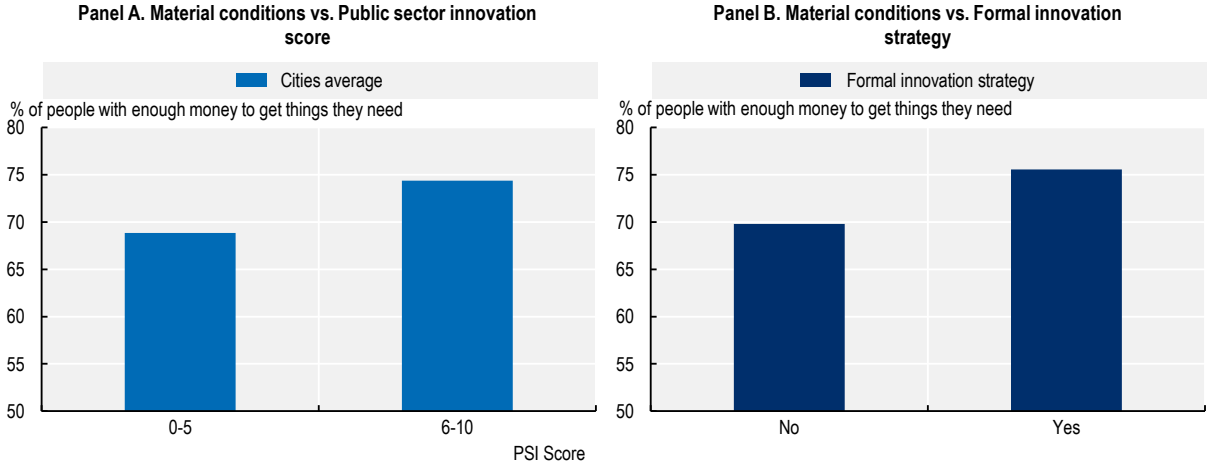
Beyond the direct links between PSI and well-being outcomes, city and life satisfaction can be related to and shaped by dimensions with indirect links to PSI practices. For example, PSI initiatives in urban transport that reduce commuting time for residents can lead to increased life satisfaction of residents, albeit indirectly, by allowing them to dedicate more time to leisure activities and social interactions. Other factors

with indirect links to city and life satisfaction include affordability of housing, accessibility to services, environmental quality and safety.

Cities with higher PSI capacity tend to be more affordable, according to residents in the studied cities. On average, around 74% of people living in cities with high public sector innovation capacity report having enough money to get things they need, compared to 69% in cities with low or no PSI capacity (Figure 2.30, Panel A). This is another avenue through which life satisfaction and PSI capacity potentially link. Innovation initiatives that reduce residents' financial strain in their day-to-day lives (for example, through better employment opportunities or access to social services) can contribute to improving people's subjective measures of well-being, such as city and life satisfaction (OECD, 2015[32]).

For example, public sector innovation applied through a formal strategy might allow for more innovative social and housing programs for residents, which translates into better self-reported material conditions. After controlling for population and average household income, cities where the largest share of residents declare having enough money to get things they need tend to have a formal strategy for innovation (Figure 2.30, Panel B). This PSI component hints at the importance of directed, and well-established, innovation efforts. In particular, having a formal strategy can offer residents a form of oversight and accountability for their local governments, which in many cases can enhance effectiveness in public service delivery (OECD, forthcoming[31]).

Figure 2.30. Public sector innovation correlates to improved material conditions in cities



Note: The association between having a formal innovation strategy and the percentage of people declaring having enough money to get things they need persists after controlling for population and the level of economic development of the city.
Sources: Gallup US Daily 2016-17; and OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

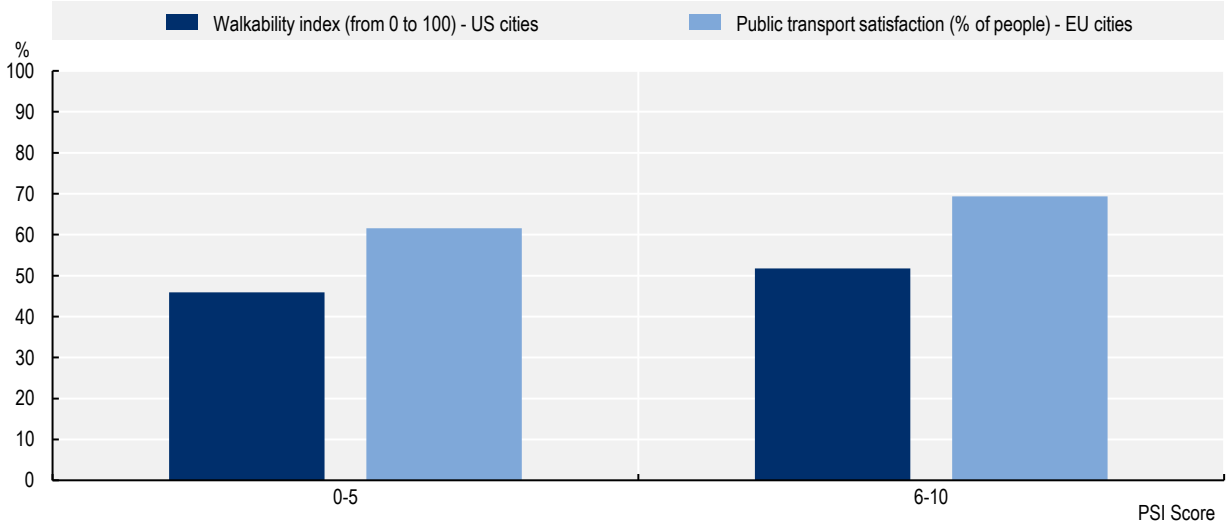
Cities with high PSI capacity exhibit higher levels of walkability and satisfaction with public transport. Based on the sample of US cities (where the walkability index is available), cities with high levels of PSI have a walkability index (i.e. number of neighbourhood amenities accessible by walking) around the 53 points – 10 index points above cities with low or no PSI. In the EU (where the indicator of public transport satisfaction is available), cities with high PSI capacity display levels of satisfaction with public transport 7 percentage points above cities with low PSI capacity (Figure 2.31). These findings are consistent with anecdotal accounts from cities that participated in the OECD/Bloomberg Survey on Innovation. For example, the city of Granada, Spain, uses Geographic Information System (GIS) technology to ensure accessibility for individuals with reduced mobility to cultural sites (Box 2.2).

According to the statistical analysis, walkability (i.e. amenities accessible by walking) links strongly to funding for innovation through a stable municipal budget (i.e. city-council approved funds and operating

budget), which is key to cope with shocks such as the current pandemic. During the COVID-19 crisis many cities found innovative ways to redistribute city space, improving walkability, cycling and public transport to ensure access to services while aligning to social distancing requirements. A shift in policy focus from *mobility* to *accessibility* to basic amenities and services has the potential to improve residents' quality of life while preserving productivity, social inclusion and the environment (OECD, 2020[36]). Cities with more autonomy in their finances are more capable to innovate and adapt to new and evolving issues requiring rapid and effective responses.

The positive effects of walkability and public transport go beyond improved accessibility and mobility. Increasing evidence shows that these types of mobility lead to higher environmental quality, for example, by reducing carbon emissions and air pollution. According to the analysis, cities with higher PSI also display slightly lower levels of PM2.5. In particular, dedicated funding for PSI is strongly related to better air quality, confirming the OECD/Bloomberg Survey responses, where environmental quality emerged as the second-most common policy area where cities apply innovation (Figure 2.23). Funding innovative programs to deal with carbon emissions and air pollution, such as incentivising the use of public transport (e.g. making it free during pollution peaks), cycling (e.g. creating new lanes), electric car sharing and rerouting traffic, could be partially leading to this result. For instance, the city of Stockholm, Sweden, saw traffic reduced by 22% and CO2 emissions by 14% after the introduction of differentiated road-pricing that favours environmentally friendly cars (OECD, 2015[37]).

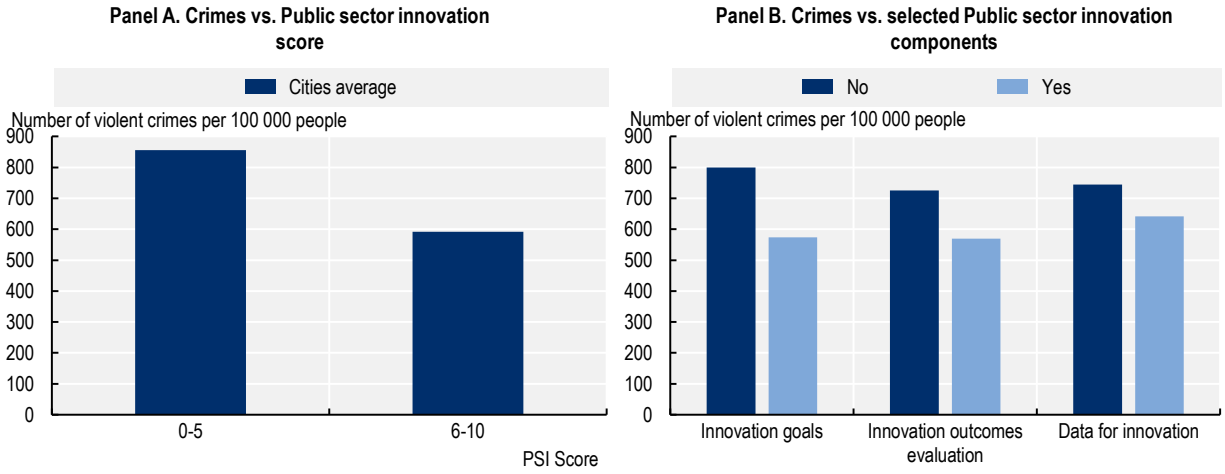
Figure 2.31. Public sector innovation and accessibility



Note: The Walkability index is only available for cities in the United States, and the indicator on satisfaction with public transport is only available for European cities.
Sources: NYU Langone Health and NYU Wagner City Health Dashboard, European Survey of Quality of Life, 2019; and OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

Cities with higher PSI capacity are safer. Innovations that improve monitoring and reporting systems (through community engagement, for example), or that revisit certain features of public space (like smart street lighting) can increase the safety of cities, and consequently city satisfaction. This link is observed for 68 American cities with available data (Figure 2.32, Panel A). In this sample, cities with high PSI capacity registered around 590 violent crimes per 100 000 people, 30% fewer with respect to cities with low or no public sector innovation. This association – robust after controlling for population and income effects – is mainly driven by three PSI practices, namely having data for innovation, setting innovation goals and applying a system of innovation outcomes evaluation (Figure 2.32, Panel B).

Figure 2.32. Public sector innovation and crimes in cities



Note: The association between the PSI components and the number of violent crimes per 100 000 people persists after controlling for population and the level of economic development of the city (Panel B).
Sources: NYU Langone Health and NYU Wagner City Health Dashboard; and OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

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Annex 2.A. Public sector innovation practices by city size and income

Annex Table 2.A.1. Adoption of PSI practices by city size and income

Innovation component	Innovation practice	% of cities with the component, by population (thousands)			% of cities with the component, by city household income (relative to national average)	
		Below 200 [36 cities]	200 to 500 [35 cities]	Above 500 [41 cities]	Below national average [38 cities]	Above national average [49 cities]
Innovation strategy (2)	Formal innovation strategy	10%	15%	21%	26%	18%
	Holistic approach to innovation	22%	25%	24%	43%	33%
Innovation staff (2)	Staff working on innovation	28%	29%	33%	53%	37%
	Innovation team older than 5 years	9%	10%	14%	20%	10%
Funding for innovation (1)	Funding to support innovation capacity	25%	27%	29%	46%	34%
Data for innovation (2)	Data is used for innovation and decision making	13%	13%	13%	20%	22%
	Data partnerships to fuel innovation capacity	24%	29%	31%	48%	38%
Innovation outcomes evaluation (2)	Systematic and comprehensive evaluation of innovation strategy and programme outcomes	6%	2%	5%	8%	6%
	Formal innovation goals	17%	16%	18%	23%	24%
Average of PSI Score (0 to 10)		**5.58**	**6.11**	**5.98**	**5.89**	**5.89**

Note: Sample of 112 cities. Number of innovation practices in parentheses.
Sources: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

Annex 2.B. Regression results: Well-being outcomes and public sector innovation capacity

Annex Table 2.B.1. Regression results: Selected well-being outcomes vs. public sector innovation capacity

	% of people satisfied with their city	% of people satisfied with their city	% of people satisfied with their life	% of people satisfied with their life	% of people satisfied with their city	% of people satisfied with their city	% of people satisfied with their city	% of people with enough money to get things they need	Number of violent crimes per 100 000 people	Number of violent crimes per 100 000 people	Number of violent crimes per 100 000 people
Specification	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*
PSI score (0 to 10)	0.781		0.332								
	(1.47)		(1.17)								
High PSI score (6 to 10)		**3.858****		1.200							
		(2.12)		(1.22)							
Formal innovation strategy (0 to 1)					**3.845****						
					(2.15)						
Holistic approach (0 to 1)						**5.568****					
						(2.15)					
Formal and holistic innovation strategy (0 to 2)								**3.965****			
								(2.27)			
Innovation staff (0 to 1)							**9.156****				
							(2.26)				

	% of people satisfied with their city	% of people satisfied with their city	% of people satisfied with their life	% of people satisfied with their life	% of people satisfied with their city	% of people satisfied with their city	% of people satisfied with their city	% of people with enough money to get things they need	Number of violent crimes per 100 000 people	Number of violent crimes per 100 000 people	Number of violent crimes per 100 000 people
Innovation outcomes evaluation (0 to 1)									**-184.5****		
									(-2.16)		
Innovation goals (0 to 1)										**-308.9*****	
										(-3.50)	
Data for innovation (0 to 1)											**-243.7*****
											(-3.01)
Household income deviation from national average (%)	0.103***	0.126***	0.0854***	0.120***	0.0972***	0.0994***	0.0875**	0.134***	-7.468***	-8.315***	-8.496***
	(2.92)	(6.61)	(3.91)	(10.14)	(2.69)	(3.05)	(2.58)	(3.07)	(-3.99)	(-4.95)	(-4.54)
Population (in thousands)	-0.0001	0.0001	0.0002	0.0004*	-0.0000	0.0002	-0.0000	0.0006	0.0491	0.0192	0.0693*
	(-0.33)	(0.26)	(1.07)	(1.94)	(-0.06)	(0.53)	(-0.16)	(0.79)	(1.18)	(0.61)	(1.80)
Constant	78.38***	79.44***	77.39***	77.13***	81.20***	78.60***	74.85***	66.23***	764.7***	897.0***	835.2***
	(22.22)	(45.85)	(44.34)	(86.84)	(54.45)	(29.83)	(18.68)	(24.54)	(12.80)	(10.30)	(11.81)
Observations	83	168	83	168	83	83	83	74	68	68	68

Notes: Linear regressions using ordinary least squares (OLS) estimation. Standard errors are corrected for heteroscedasticity. t statistics in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01.
Sources: Gallup US Daily 2016-17; NYU Langone Health and NYU Wagner City Health Dashboard; and OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

3 Data use as a feature of policy making in cities

This chapter begins with a definition and taxonomy of data, then analyses the implications of data use at each stage of the government data value cycle. It demonstrates how local governments can leverage data to generate public value and improve residents' well-being, from anticipating future trends and risks, to improving public services and supporting evidence-based governance through evaluation and impact assessment. The chapter also presents a tailored OECD data governance framework for the local public sector. The framework aims to help local governments target data governance elements at the strategic and tactical layers to generate public value and transition to a data-driven organisation. The chapter concludes with patterns and findings on data use and well-being outcomes in cities.

The role of data in supporting local governments

Local governments increasingly recognise the roles of data in improving residents' well-being. In their daily operations, local governments generate and assemble a massive quantity of data with diverse forms and characteristics. The insights derived from such data can contribute to the processes of knowledge creation, innovation and policy making. Indeed, enhanced access to and strategic use of public sector data can "lead to important value creation from economic, social, and good governance perspectives" (OECD, 2015[1]). The phenomenon is accelerated by socio-economic and technological trends such as the growing capacity for data generation, collection and dissemination, the recent developments in data analytics, and the emergence of a paradigm shift in knowledge creation and decision making. Despite these advances in capabilities and awareness, the full potential of a data-driven public sector still eludes many governments, failing to consistently result in tangible outcomes. Recognising data as a resource is the first step in transitioning toward building a data-driven government.

Definition and taxonomy of data

The fuzzy definition and interchangeable usage of the term "data" with related terms contribute to confusion. The term "data" has several meanings depending on the context and jurisdiction, and may refer to raw and unstructured data in various formats, personal information, administrative records, or factual information in various forms and formats. In some instances, "data" can be synonymous with "information", while in others, the latter is specifically understood as "the meaning resulting from the interpretation of data" (OECD, 2015[1]). In this report, the term "data" covers only raw and unprocessed facts and statistics, while "information" represents the meanings conveyed through processed and assembled data. Subsequently, "knowledge" or "intelligence" are gained through the assimilation or internalisation of information. The distinction between these terms is crucial in understanding the cycle of data as well as the benefits it provides. For example, local governments may possess a large amount of data, yet have neither the tools nor the capabilities to clean, store, extract information, and generate public value from it. Likewise, governments may also suffer from "information overload", making it difficult to leverage data to glean insights for decision making (OECD, 2015[1]). In this report, "government data" may be used synonymously with "public sector data", which is generated, created, collected, processed, preserved, maintained, disseminated or funded by or for governments and public institutions at various levels, according to the *OECD Recommendation of the Council for Enhanced Access and More Effective Use of Public Sector Information* (OECD, 2008[2]). These data can be generated either directly or indirectly from public sector operations.

Box 3.1. Definitions of data-related terms

- **Data** are understood as the representation of facts stored or transmitted as qualified or quantified symbols. In contrast to knowledge and information, data are assumed to have an "objective existence", and they can be measured, namely in bits and bytes. Data can also be the result of datafication, a portmanteau for "data" and "quantification", where a phenomenon or object is transformed into quantified symbols. Datafication should not be confused with digitisation, which refers to the process of encoding information into binary digits (i.e. bits) so it can be processed by computers. Data that have not been digitised cannot be processed by computers.
- **Information** is often seen as the meaning resulting from the interpretation of facts as conveyed through data or other sources such as words. This meaning is reflected in the structure or organisation of the underlying source, including its hidden relationships and patterns of correlations, which can be revealed through data analytics. Information is therefore always context-dependent: it depends on the capacity to extract meaning from the information source; this capacity depending on available data analytic techniques and technologies as well as the skills and (pre-)knowledge of the data analyst.
- **Knowledge** is understood as information and experience internalised or assimilated through a process, commonly referred to as "learning". It provides the "learner" with the capacity to make effective decisions autonomously. Knowledge can be explicit, in which case it can be cost-effectively externalised to be communicated and embedded in tangible products, including books, standard procedures and intangible products such as patents, design and software. But it can also be tacit, based on an "amalgam of information and experience", which is too costly to codify and thus to externalise.

Source: OECD (2015[1]), *Data-Driven Innovation: Big Data for Growth and Well-Being*, https://dx.doi.org/10.1787/9789264229358-en.

Understanding different types of data and their implications will help governments establish an effective framework for data governance, open the private sector to partnerships with the public sector, and most importantly equip residents (i.e. data generators) with better understanding of their rights and risks associated with data use. However, key actors in the data ecosystem, including local government agencies, the private sector (e.g. IT infrastructure companies, data service providers, data-dependent entrepreneurs, etc.) and residents do not seem to fully grasp the differences between data types and levels of access (i.e. openness). For example, not all data generated by the public sector is non-personal, which can be readily made available to the public. Similarly, data collected and produced by local governments is not necessarily public data until it has been uploaded and shared in the public domain (e.g. a city's open data portals). On many occasions, the term "public" can be used to denote either ownership or domain.

The overlapping elements of different data types show that a taxonomy of data is needed to provide a common language for actors in the data ecosystem. Different data taxonomies have been proposed to provide key actors with a common language. One such categorisation comes from the Data Collaboratives (Verhulst, Young and Srinivasan, n.d.[3]) where (corporate) data is classified into four quadrants based on whether data is personally identifiable and whether it is disclosed by the subject or observed by a controller: (1) disclosed personal data, (2) observed personal data, (3) disclosed non-personal data and (4) observed non-personal data. For instance, "disclosed personal data" refers to "personally identifiable information actively and intentionally shared by an individual, entity or group for a specific reason", including registration records. While "observed non-personal data" covers "information with no personally identifiable elements that is passively collected by an entity prior to any use" such as satellite and aerial imagery.

However, the binary dichotomy in this taxonomy may not fully capture the nuances of certain data types. As such, in an attempt to introduce a more comprehensive categorisation, the OECD (2019[4]) proposed a data taxonomy based on four main aspects: (1) personal data and the degrees of identifiability, (2) the domain of data, (3) the manner data originates and (4) possible access control mechanisms (See Box 3.2).

Box 3.2. OECD taxonomy for the governance of data access and sharing

Data comes from various sources and possesses different policy implications depending on its characteristics, such as the degree of anonymity, accessibility and openness, and how it is collected, stored, processed and used to generate value. Understanding different data types can help public sector organisations adopt a more differentiated and comprehensive approach to data use. The OECD (2019[4]) provides a taxonomy of data based on four main dimensions:

- **Personal data and the degrees of identifiability**: Personal data is often referred to as "any information relating to an identified or identifiable individual (data subject)", according to the OECD's Recommendation of the Council Concerning Guidelines Governing the Protection of Privacy and Transborder Flows of Personal Data (2013[5]). However, the demarcation between personal vs. non-personal is increasingly blurred as developments in data analytics facilitate the process of linking non-personal data to identified or identifiable individuals (OECD, 2019[4]; Ohm, 2009[6]; Narayanan and Shmatikov, 2006[7]). Instead of the traditional binary split, the ISO/IEC 19941 (2017[8]) elaborated five categories of data based on identifiability (the extent to which a given data can be traced to an identity). The data categories include: Identified, Pseudonymised, Unlinked Pseudonymised, Anonymised, and Aggregated.
- **Domain of data:** Like personal vs. non-personal data, the dichotomy between public-sector vs. private-sector data does not capture nuanced cases where data are jointly collected and processed via public-private partnerships, or where data is generated by the private sector thanks to public funding. The distinction also creates confusion with public (domain) vs. private (proprietary) data, which refer more specifically to the openness of data. Lastly, the split does not account for personal data. Therefore, this aspect of the taxonomy proposes three non-mutually exclusive categories where data may be situated, namely: Personal, Public and Private domains. Personal domain refers to "all personal data relating to an identified or identifiable individual for which data subjects have privacy interests". Private domain refers to "all proprietary data that are typically protected by intellectual property rights…or by other access and control rights". Public domain data refers to readily accessible and free-of-charge data not protected by intellectual property rights. These categories demonstrate different roles various stakeholders may play in each stage of the data cycle, attesting to the complexity of establishing comprehensive data governance.
- **The manner data originates**: The manner data originates focuses on the co-creation process, where various stakeholders collect and generate data. The categories proposed – Volunteered, Observed, Derived, and Acquired data – seek to illuminate not only the extent to which individual data subjects are aware of the data generation process, but also the degree of stakeholders' involvement. While volunteered data is actively and intentionally provided by data subjects (e.g. social media profiles), observed data is passively generated by individuals (such as GPS locations or online activities/behaviours) and actively recorded by data controllers. Derived data is synonymous with data processed by analytics, with the data subject having little awareness of how data originates (credit scores based on financial history). Finally, acquired data is typically purchased from third parties with stringent restrictions regarding sharing and re-use.

- **Data-access control mechanisms**: This covers a variety of technical mechanisms for assessing data such as ad-hoc downloads, Application Programming Interfaces (API), data sandboxes, etc.

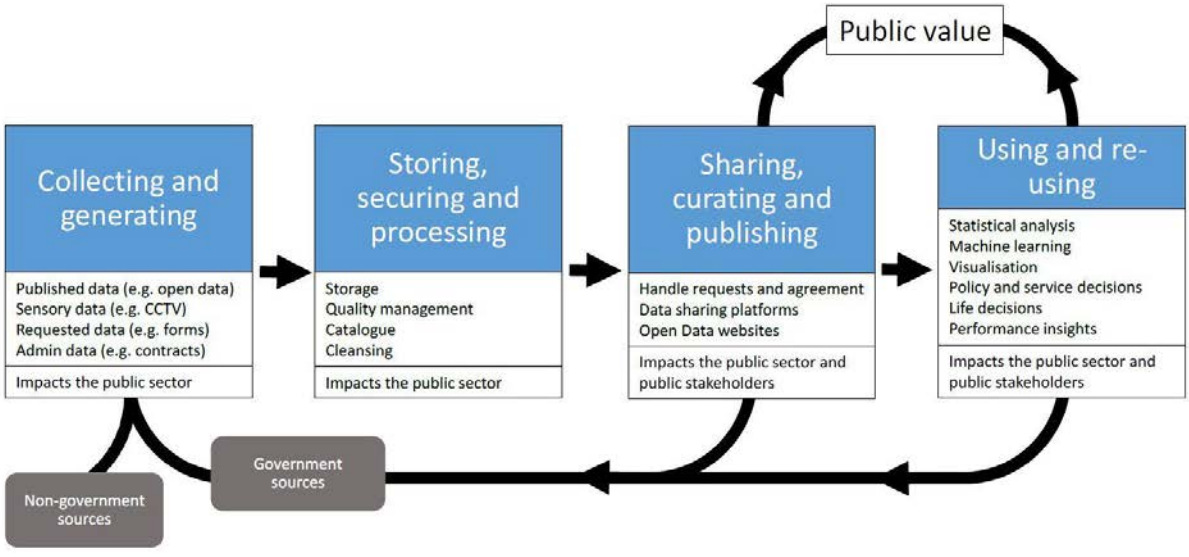
Source: OECD (2019[4]), Enhancing Access to and Sharing of Data: Reconciling Risks and Benefits for Data Re-use across Societies, https://dx.doi.org/10.1787/276aaca8-en.

Implications for cities throughout the government data value cycle

Identifying the pathway and tasks needed to transform government data into information and knowledge can help local authorities navigate and maximise the value of data at each stage (OECD, 2019[9]). Therefore, van Ooijen, Ubaldi and Welby (2019[10]) proposed a government data value cycle (Figure 3.1), identifying four stages through which government data flow and the associated values generated during each stage: (1) data collection and generation, (2) data storage and processing, (3) data sharing, curating and publishing, and (4) data use and re-use.

This analytical framework, presented as a feedback loop of value creation, begins with the data collection, generation, storage and processing stages where impacts and implications are restricted to the internal administration. Only during the two final stages – data sharing and data use – does the wider public noticeably experience the value generated from government data. Further, the data, information, and insights generated from these two final stages return as inputs for the first stage, creating a feedback circuit for the government data value cycle. It should be noted that improper handling during any stage of the cycle might cascade into subsequent stages. This section discusses the implications, risks and barriers to data use that local governments might face at various stages of the government data value cycle.

Figure 3.1. The government data value cycle



Source: OECD (2019[9]), *The Path to Becoming a Data-Driven Public Sector*, https://dx.doi.org/10.1787/059814a7-en.

Data collection and generation

Data collection and generation lay the groundwork for data use. Data collected, generated or obtained by local governments comes from various sources. They can be personal data collected from residents as part of an administrative process, internal records obtained from government activities or customer data generated from public-private partnerships for service delivery. Local governments can also source data from other public or private open data portals. In recent years, a large share of Internet of Things (IoT) sensors embedded in urban infrastructure such as transport, energy, healthcare and social services have generated large amounts of data. Indeed, some data are readily available to municipal administrations, requiring little effort for data collection. Others might require a more coherent strategy to allow local governments to obtain the data.

It is undeniable that local governments generate a huge amount of data that allows them to effectively carry out their everyday functions. However, these data tend to be collected with a "single-use only" purpose. The lack of standards for data collection and this "single-use only" mindset can lead to collection of duplicate data, an extra burden on service users and increased costs of processing and hosting data.

Additionally, local governments need to ensure that their data efforts not collect unreliable and outdated data that would hamper the ability to glean valuable insights. In their efforts to move quickly toward a data-driven organisation, local governments risk generating data from non-representative or biased samples by not account for the digitally excluded population. This would pose a problem should cities aim to leverage such data for targeted public policy intervention.

Data storage and processing

Storing and processing data carries privacy and security implications that can either improve or undermine public trust in government. As mentioned, the lack of standards in data collection and coding makes integrating sources and linking up data a challenge for municipalities. Potential problems with data processing and storage stem from the lack of data management and analytics capacity among municipal staff, and the lack of a coherent strategy and data culture within the organisation.

Even though linking up data would allow municipalities to construct more comprehensive datasets for in-depth analysis, it also poses privacy risks in case of security breaches, especially when it comes to personally identifiable data or data that can easily be de-anonymised. Data linkage, when leading to a single repository or database, can create a vulnerability that could compromise the government data (including personal data collected from residents) on which many municipal services rely. Due to these concerns, in many jurisdictions "the separation of linkage and analysis processes is therefore considered as best practice for confidentiality" (OECD, 2019[4]). Different trusted parties thus undertake the tasks of linking up data and data analysis.

City governments face a challenge to ensure that municipal networks and digital infrastructure are secure as online activities proliferate and cities commit to digitalisation of public services. Since the beginning of the COVID-19 crisis, more people found their professional and personal lives relocated online. During the first lockdowns, the number of people working from home in France increased tenfold; online shopping activities doubled. According to France Digitale, the number of cyber-attacks increased fourfold, both in frequency and intensity (Midena, 2020[11]). Ensuring the security of municipal systems should be government's priority at every step of their handling data. It is particularly crucial during the data storage and processing stages, where responsible agencies must deal with a wide range of generated data, some of which is personally identifiable or proprietary.

Box 3.3. Immunising municipal networks against digital risks

From Newark (New Jersey) to Baltimore (Maryland), American cities of all sizes in recent years have been highly susceptible targets of digital breaches. In March 2018, a ransomware cyberattack brought municipal networks in Atlanta, GA, United States to a standstill. The hackers held the city hostage for nearly a week, demanding USD 51 000 of payment in bitcoins. The security breach stopped public Wi-Fi and reduced many municipal services to pen and paper. The Atlanta Municipal Court resorted to manual processing of cases. Law enforcement officers went back to writing incident reports by hand. Meanwhile, residents were unable to pay their traffic tickets and water bills, or apply for and renew business licences. The city also temporarily lost a huge amount of data in the forms of online correspondence, police camera footage and legal documents. In the end, Atlanta refused to pay the ransom and spent more than USD 17 million to upgrade security systems. The city also implemented a cybersecurity framework, engaged in dialogues with federal and state agencies, and increased digital security awareness among municipal employees and residents.

Source: Freed (2019[12]), One year after Atlanta's ransomware attack, the city says it's transforming its technology, https://statescoop.com/one-year-after-atlantas-ransomware-attack-the-city-says-its-transforming-its-technology/; Sneed (2019[13]), What Cities Can Learn From Atlanta's Cyberattack, https://www.bloomberg.com/news/articles/2019-10-29/what-cities-can-learn-from-atlanta-s-cyberattack

Data sharing, curating and publishing

Data sharing practices vary across public organisations, due mostly to the respective legal frameworks (or the lack thereof) in each country. At one end of the spectrum, countries such as Korea, Portugal, Israel and Estonia adopt a proactive approach to intra-government data sharing (OECD, 2019[4]; OECD, 2019[9]). Motivated by the "once-only principle" where public organisations should not collect the same data as another public-sector database, Estonia's X-Road initiative enables information systems from various public and private organisations to securely link up and exchange data. Another example of the "once-only principle" implemented at the local level includes was launched by the city of Monheim am Rhein, Germany, where residents can access a variety of public services through a single entry of their personal information. Thus, residents are not required to provide the same data multiple times to access public services provided by different city agencies. The initiative aims to reduce administrative burdens for residents and businesses, and also minimise digital risks by building a single, secure and centralised repository of data in the city's system (European Commission, 2019[14]). On the other end, countries such as the United Kingdom do not institutionalise a formal mechanism for data sharing between public bodies, implying that data sharing can occur on an ad-hoc basis or after one-off requests (OECD, 2019[4]).

Data sharing at the local level can depend on national legal and strategic frameworks. In their absence, local governments' efforts to share and leverage data might become complicated. During the Expert Workshop on Boosting City Government Capacity to Innovate and Use Data for Better Policies and Resident Outcomes, organised by the OECD and Bloomberg Philanthropies, the Director of GobLab UAI, a public innovation lab in Chile, noted that local governments in Chile struggle to utilise administrative data, which is centralised at the national level despite most data collection occurring locally. To access these data, local administrations must enter into a data-sharing agreement with the national government, which can take up to a year and might hinder efforts to leverage data in an effective and timely manner. The country thus is considering a change of legislation to allow easier access and integration of administrative data at the national level. This example shows how systemic hurdles to data use cannot be resolved solely by local governments.

Publishing government data enables external stakeholders such as the private sector, concerned residents, and the civil society, to use, re-use and generate even more social and economic value beyond their intended use by the government. In recent years, there is a noticeable trend towards the open data movement where (in the absence of conflicting interests) government data are widely expected to be published in a user-friendly format online (see "Data openness", below).

Data use and re-use

Data use and re-use represent the last stage of the government data value cycle, where the value derived from data are most discernible to the wider public. Local governments with a mature approach to data rely on data analytics to derive knowledge for their targeted interventions. Data analytics are "the process of crosschecking, cleaning, reorganising and modelling data for decision making" (Auditor General for Wales, 2018[15]). Analysis based on inaccurate statistical reasoning, erroneous modelling, and biased algorithms would undermine the effectiveness of intended interventions. While the effectiveness of data-driven public policy could suffer if undetected risks and defects at earlier stages in the cycle have detrimental effects on the intended interventions, the use and reuse of data is nonetheless the key to anticipating trends and risks, improving public service delivery, evaluating performance, assessing impacts and monitoring programme outcomes (see "Unlocking the value of data for the local public sector", below).

Thus, data and the knowledge derived from data should serve more as a tool to solve public problems, rather than the solution in themselves. A data-driven project is only as useful as the issues that it attempts to resolve. Drawing from their experience teaching "Data Science project scoping" to public sector managers in Chile, GobLab UAI note that government agencies at both the local and national level had a hard time with problem definition, struggling to define the issues that their data-driven project or service is trying to solve. Unsound problem definition would result in data being used in a counterproductive manner, potentially distorting insights and leading to ineffective interventions. When data is finally used (and re-used), it can yield the most concrete impacts for governments and contribute to the improvement of residents' well-being.

Unlocking the value of data for the local public sector

Local governments have a critical role in leveraging data to improve residents' well-being. Municipalities can use data to adopt a more customer-oriented approach, ensuring that public sector activity is motivated by tangible outcomes for residents rather than by symbolic motives like ideology or media attention. Additionally, municipalities can use data to create feedback loops that build equity and capture emerging trends to forecast future needs. Indeed, data enables governments to foresee trends and risks, allowing them to minimise or even pre-empt potential crises/problems. Secondly, local governments can leverage data to guide public service design and delivery in a more evidence-based, practical and efficient manner. Lastly and most importantly, data allow local governments to learn from their successes and shortcomings by measuring outcomes and iterating their interventions. Such data-driven self-scrutiny can help public agencies mature from making isolated, project-based investments to undertaking sustainable long-term, higher-impact initiatives (Salge and Vera, 2012[16]).

Data-driven monitoring and assessment also link to the previously mentioned improved service delivery and anticipation. While a focus on users and learning from implementation may seem like obvious goals for local governments, impact assessment and outcomes measurement are also key to building an accountable and transparent public sector.

Anticipating future trends and risks

Governments can leverage data, including historical and real-time data on geographical location, sensors and evidence from previous interventions to detect emerging societal, economic or natural developments, forecast future risks and formulate targeted policy interventions (see Box 3.4). Through integration of predictive analytics into public service planning and delivery, municipalities can develop insights into community challenges and residents' unmet needs. Different from descriptive statistics, predictive models leverage large datasets of current and historical observations to predict patterns and forecast outcomes. When combined with real- and near-time data feeds, predictive analytics provide local governments with powerful, actionable insights to undertake preventative and pre-emptive measures to deliver more effective and timely interventions. In practical terms, predictive analytics allow cities to "focus the allocation of scarce resources, identify adverse events, and ascertain the effectiveness of tested interventions" to deliver better outcomes for residents (Toderas and Manning, 2019[17]).

Recent developments in data analytics including the ease, volume and rate at which data are collected and stored, and access to more powerful software and hardware that enable local governments to improve their ability to conduct predictive modelling. Despite gaining traction among local governments, predictive analytics generally remains at a nascent state. Indeed, while the private sector long integrated predictive analytics in various domains (e.g. marketing, telecommunication, insurance and retail, etc.), the adoption of such methods among public sector organisations leaves much to be desired. The UK Local Government Association (2020[18]) found that predictive analytics by local governments tends to be experimental or exploratory, small-scale and limited in scope. Projects employing predictive analytics tend to be confined to areas such as child protection, personal social care, housing repair, credit control and inquiry handling. The research identified a set of interlinked factors that influence the adoption of predictive analytics in local governments, including but not limited to (UK Local Government Association, 2020[18]):

- corporate understanding of the value and potential of predictive analytics
- enabling environments for digital innovation
- strong data expertise and/or ability to acquire such expertise
- support from frontline staff whose services leverage predictive analytics
- public confidence in data science and the potential of data-driven decision making
- extreme budget constraints that force municipal governments to prioritise their investment in the most targeted ways.

Box 3.4. Examples of predictive analytics for targeted interventions at the local level

- **East Sussex County Council, United Kingdom,** partnered with the UK Behavioural Insights Team, using collision data collected over a decade to reduce dangerous road accidents. The team developed predictive models that "test historically held beliefs, predict future behaviours and recommend how interventions could be better targeted." The team found that occupational drivers are not disproportionately involved in serious collisions. Most of these collisions involved local drivers or those who had previously been caught speeding.
- **Jakarta, Indonesia,** collaborated with start-up company Qlue to predict and prepare for floods. Jakarta's Smart City Unit and Qlue use historical data on water level, weather conditions and trends in residents' complaints to predict the intensity of floods in specific locations for the following year. The partnership would soon expand to predict and prepare for dengue hotspots.
- **London Borough of Barking and Dagenham, United Kingdom,** combines data from their ethnographic research with predictive analytics tools provided by private company Xantura to pre-emptively determine households at risk of homelessness. Case workers reach out to identified households for a consultation and to offer interventions. This proactive approach increased the success rate of homelessness prevention and led to better adoption of prevention services offered by the local authorities.
- **New Orleans, LA, United States,** produced a predictive analytics model to identify households ill-equipped with smoke detectors and those most likely to suffer from fire fatalities. The project was a collaboration between the New Orleans Fire Department (NOFD) and Office of Performance and Accountability (OPA). As NOFD did not have historical data on locations of smoke detectors, OPA resorted to data from the U.S. Census Bureau's American Housing Survey and the American Community Survey. The model was instrumental in helping NOFD identify households at risk and install 8 000 smoke detectors from 2014 to 2016.
- In **Scottsdale, AZ, United States,** the Water Department uses predictive analytics to determine planned water use for their annual water order. The data analysis saves the department nearly USD 500 000 each year.

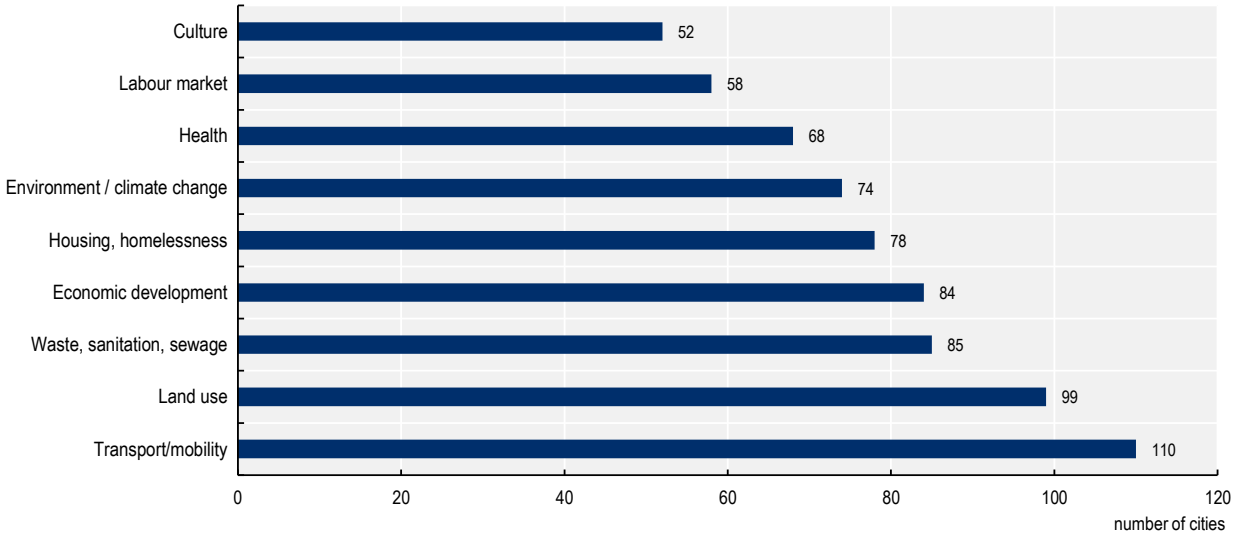
Source: OECD (2019[9]), *The Path to Becoming a Data-Driven Public Sector*, https://dx.doi.org/10.1787/059814a7-en; The Behavioural Insights Team (2017[19]), *The Behavioural Insights Team Update Report 2016-17*, https://www.bi.team/publications/the-behavioural-insights-team-update-report-2016-17/; Basu (2016[20]), Jakarta's plans for predictive government, https://govinsider.asia/innovation/jakartas-plans-for-predictive-government/; Local Government Association (2020[18]), *Using predictive analytics in local public services*, https://www.local.gov.uk/using-predictive-analytics-local-public-services; Hillenbrand (2016[21]), *Predicting Fire Risk: From New Orleans to a Nationwide Tool*, https://datasmart.ash.harvard.edu/news/article/predicting-fire-risk-from-new-orleans-to-a-nationwide-tool-846; What Works Cities (WWC) Certification.

Improving local public service delivery

Cities, typically regarded as testbeds for innovation, have a unique position to leverage data for improved public service delivery. These data can be used to "inform and improve policy implementation, the responsiveness of governments, and the activity of providing public services" (OECD, 2019[9]). Indeed, cities produce, generate and store an enormous volume of valuable data. By 2022, it is generally expected that "cities will host at least 10 billion out of 14 billion data-generating devices in use in OECD countries" (OECD, 2015[1]; OECD, 2012[22]; OECD, 2010[23]). Additionally, a large share of the 65 million sensors embedded in infrastructure around the world are in urban settings across health care, environmental, transport, water and energy sectors, generating a huge swath of data. The sheer volume and variety of data across key policy sectors make cities an ideal environment for data-driven innovation.

The OECD/Bloomberg Philanthropies Survey on Innovation Capacity in Cities shows that, while cities produce and generate a large amount of data, its availability across policy sectors remains unbalanced. When asked whether surveyed cities possess sufficient data for decision making (within the context of innovation work), most report having data for transport and mobility (77%), land use (70%), and waste and sanitation (60%). Meanwhile, fewer than half report having data for areas such as health (48%), labour market (41%) and culture (37%). The availability (or unavailability) is due mostly to factors such as the nature of these policy sectors, the strategic priorities of municipal government and most importantly local governments' capability to gather and collect relevant data.

Figure 3.2. Cities have varying degrees of data across policy areas



Note: Out of 147 participating cities for both OECD/Bloomberg Philanthropies surveys, 142 responded to the question "Does your city have sufficient or insufficient data in the following areas to advance your innovation work?" Surveyed cities were asked to select all policy areas that apply; every policy area chosen corresponds to one unit.
Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

Notwithstanding the unevenness in data availability, all this data holds potential for cities to enhance the efficiency and productivity of their urban systems, facilitate new business opportunities and improve urban governance (OECD, 2015[1]). As Table 3.1 conveys, the abundance of data flows collected both in near/real-time and in the past across key urban systems such as transport, land management, and water, waste and sanitation allows analysis at a remarkable depth and rate. The granularity of urban data flow is crucial for targeted intervention, enhancing the efficiency of urban systems.

The use, re-use and sharing of public sector data can generate products and services that "contribute in a variety of ways to improved efficiency and productivity within the public sector," making data a driver "of growth, employment, as well as of improved public service delivery and more efficient, transparent and participatory governance." (OECD, 2015[1]). Leveraging of data by cities can also "create societal benefits like less pollution, fewer traffic jams, improved tracking of disease outbreaks, greater energy efficiency, new agriculture services, novel applications to transform citizen experience interacting online with government, and lower costs," all of which could lead to improved well-being for urban residents (Janssen et al., 2017[24]).

Table 3.1. Leveraging data to enhance the efficiency and quality of urban systems

Transport and environment	Land management	Water, waste and sanitation
As part of the "Horizon 2020" initiative funded by the European Commission, six urban neighbourhoods in Amsterdam (Netherlands), Barcelona (Spain), Ghent (Belgium), Fundão (Portugal), and Palermo (Italy) participated in the Mobility Urban Values (MUV) project, in which residents earn points through a mobile game for making sustainable mobility choices. These points could be redeemed for a cup of coffee or similar rewards from local businesses. MUV integrates users' mobile app, a monitoring stations network and a cloud platform to process data. The mobility and environment data collected from the platform are made available as open data, contributing to the development of new services and helping inform urban policies.	In 2010 in New Orleans, LA, United States, the Office of Performance and Accountability (OPA) was tasked with tackling city-wide blight remediation through data analytics. OPA developed a data-driven management tool, BlightSTAT. Through a criteria-based Blight Scorecard, each property was scored from 0 (demolition strongly recommended) to 100 (sale strongly recommended). In three months, the tool enabled the Department of Code Enforcement to clear the backlog of properties awaiting decisions. The programme also ensured that recommendations were rendered quickly, consistently and transparently.	In 2016, the city of Los Angeles, CA, United States, launched CleanStat, allowing sanitation crews to regularly assess and grade the cleanliness level of each street and alley in the city. Data are automatically transmitted to a service request database, helping the city identify and prioritise 35 000 bulky items and illegal dumping clean-up requests each month. One year after its launch, the city reduced the number of unclean streets by 82%. This past year, the city added the ability to track encampments of LA's homeless to co-ordinate services that keep encampments from being hazardous while connecting the community to multiple city-offered services.

Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities; City of New Orleans (n.d.[25]), *Code Enforcement Abatement Tool: A NOLAlytics Project*, https://www.nola.gov/performance-and-accountability/reports/nolalytics-reports/nolalytics-blight-abatement-tool-brief/; Results for America (2018[26]), How to Clean City Streets? Los Angeles Begins by Collecting New Data, https://results4america.org/wp-content/uploads/2018/12/LosAngelesCaseStudy_Final.pdf.

The public value of government data extends beyond local authorities holding and employing these data. Published datasets can complement privately held proprietary data, giving stakeholders a holistic perspective and improving their problem-solving capacity. When government data are readily available (either for free or for purchase), potential users of such data, in combination with data analytics, can increase the benefits of data re-use and further magnify the public value of data across society.

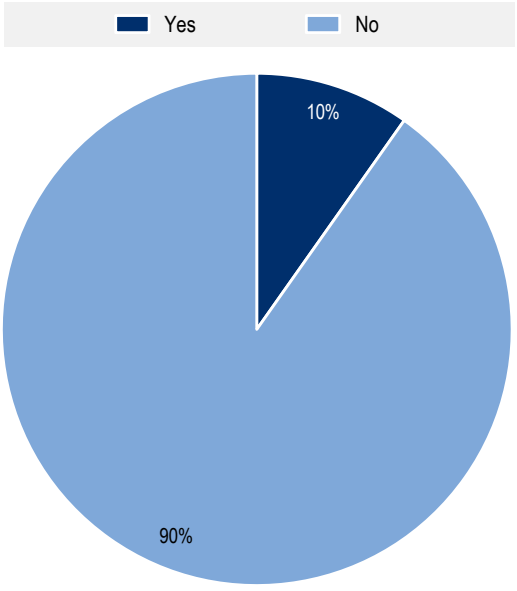
There is an economic case for a more data-driven and data-capable public sector, with studies estimating the direct impact (i.e. benefits to data providers), indirect impact (i.e. benefits to data users) and induced impact (i.e. benefits to the wider economy) of government data. According to a report from Deloitte for the UK Department of Business, Innovation and Skills, "direct economic impact (as revenue for public sector information holders) is estimated at around USD 130 million, while the indirect impact on data users and suppliers of data public sector information is between USD 1.6 billion to USD 2.4 billion annually. The wider indirect and induced impact of public sector information was conservatively estimated to be around USD 6.5 billion per year." (Deloitte, 2013[27]). Other studies on public sector information re-use at the EU level estimated the market to be around USD 38 billion in 2010 (Vickery, 2011[28]; OECD, 2019[4]). Meanwhile, its aggregate indirect and induced economic impact across 27 European economies is estimated at USD 165 billion annually (equivalent to 1.5% of their GDP). Through greater sharing and use of data, cities enable residents and entrepreneurs to develop new urban solutions, stimulate competition and bring down the marginal costs of urban services (Cohen, Almirall and Chesbrough, 2016[29]).

Monitoring, evaluation and impact assessment

Successful monitoring, evaluation and impact assessment begins with a strong culture of evidence-based governance, where data is used, re-used and shared to monitor and evaluate social and economic programmes, support evidence-based decision making and increase public accountability. For example, the City of Moscow, Russia, uses healthcare service indicators to assess the performance of healthcare systems and assist a wide range of health-related research activities (Box 3.5). However, while there has long been discussion of how data can produce evidence-based evaluations of government activities and other public sector innovation, there is not yet a strong culture of evidence-based governance. As of

April 2020, only 15 of the 153 local governments in the WWC Assessment programme had defined standards, methodologies or tools to help staff evaluate practices, programmes or policies (see Figure 3.3).

Figure 3.3. Few cities have standards, methodologies or tools for data-driven evaluation



Note: Out of 153 cities participating in the WWC Assessment programme as of April 2020, 15 cities meet the criterion for "Your local government has defined standards, methodologies, or tools to help staff rigorously evaluate practices, programs, and/or policies".
Source: WWC Certification Database.

Box 3.5. Integrated Medical Information and Analytical System in Moscow, Russia

The Integrated Medical Information and Analytical System (IMIAS) improves the quality of healthcare delivery in Moscow by centralising the electronic medical records of Muscovites. IMIAS facilitates access to healthcare services online – such as locating the nearest medical institutions, scheduling an appointment or accessing medical e-records – and reduces the administrative burden on medical personnel. By continuously updating non-sensitive data from patients in real time, the system provides authorities with performance metrics like the number of patients, waiting times, length of visits and estimated cost savings, which can be used to improve Moscow's healthcare system.

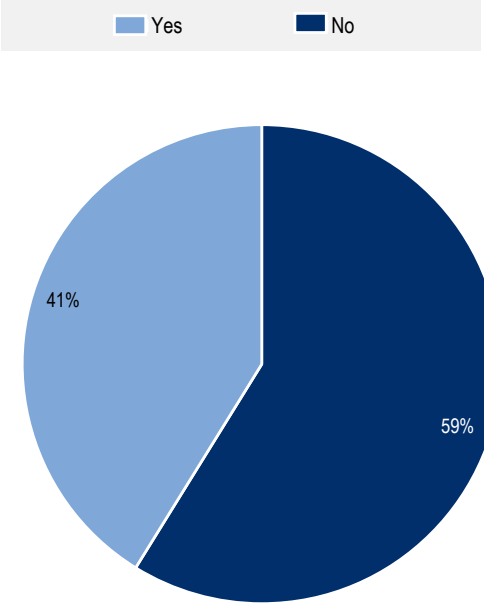
Source: OECD/Bloomberg Philanthropies (2020), Survey on Innovation Capacity in Cities.

Evaluation contributes to learning processes (with the aim of improving, replicating or even abandoning a policy or activity) and informs policy makers about the effectiveness of interventions. Generally, evaluation refers to the methodical and objective assessment of past and present projects, programmes or initiatives. Such assessments can take place at various stages (e.g. project design, implementation, outputs). As understood by What Works Cities and their partner cities, the ability to measure, monitor and evaluate public services and programmes through data allows local governments and residents to determine whether policies, programmes and innovation pilots really produce positive outcomes and impacts relative to their objectives.

With empirical evidence, residents and local governments can have informed debates and decide which initiatives receive funding, staffing and support. Such data lead to more efficient budget allocation and improvements to project implementation, and they support comparative analyses that help address the "very fragmented and dispersed nature of public innovation" (Vries, Bekkers and Tummers, 2016[30]).

Understanding the progress and tangible outcomes (or a lack thereof) leads to a more refined process of implementation that yields more substantial results. Instead of blindly investing in any project, resources could be re-allocated to those that show signs of achieving the city's strategic goals. From the WWC Assessment programme, 41% of cities indicated that they leverage the insights from data to align their budget process with their strategic goals (see Figure 3.4).

Figure 3.4. Cities that leverage data to align budget processes with strategic priorities



Note: Out of 153 cities participating in the WWC Assessment programme as of April 2020, 63 cities meet the criterion for "Your local government uses data to align its budget process with its strategic priorities".
Source: WWC Certification Database.

According to the 2020 OECD/Bloomberg Philanthropies Survey on Innovation Capacity, as part of the Dallas 365 Plan, the city of Dallas, TX, United States, publicly tracks its progress in 35 performance measures aligned to the city's six strategic priorities. These indicators help the city's Office of Budget benchmark performance and allocate resources during the budget development process. Likewise, the City Council of Bristol, United Kingdom, leverages data to align its budget process with its strategic priorities. Despite being distinct mechanisms, budget setting closely links to the Service Planning and Performance monitoring process. The City Council also produces an annual Business Plan with actions and objectives underpinned by data and evidence-based priorities. A more systematic data-driven approach to governance, like those in Dallas and Bristol, might move the public sector away from wasteful spending toward projects stronger in substance and sustainability (OECD, 2020[31]; OECD/Eurostat, 2018[32]). Ultimately, using quantitative metrics to guide decision making around governance could lead to more tangible outcomes and impact. With proper evidence, governments and the public would, for example, be able to discern whether a given public sector innovation reduced CO2 emissions, or if a given policy change led to greater inclusion of minority groups in economic growth over time (Gault, 2018[33]).

Box 3.6. Examples of city governments leveraging data to monitor, evaluate and assess the impact of their programmes

- **Adelaide, Australia,** leverages data analytics to learn who uses citywide infrastructure (e.g. digital infrastructure for students and tourists, roads, parking and loading bays for SMEs, etc.) and how. Monitoring of physical infrastructure allows Adelaide to schedule maintenance and replacement projects with greater accuracy, optimising municipal resources such as their workforce and equipment.
- **Amsterdam, Netherlands,** has a special IOS department tasked with measuring policy outcomes and producing relevant data across areas like health, safety and sustainability. Meanwhile, the Chief Technology Office assesses the achievement of their own innovation projects and initiatives. Amsterdam is currently exploring a City Innovation Index – a framework to measure innovation efforts in general throughout the city.
- **Barcelona, Spain,** measures the number of people at risk of social exclusion who do not have access to public aid offered by the city. This allows the municipality to understand the needs of residents and provide them with better social care services.
- **Bologna, Italy,** measures a range of indicators such as air quality (i.e. level of PM10) or short-term housing rentals to support social and economic programmes in the city.
- **Bristol, United Kingdom,** through the Strategic Intelligence and Performance Team, provides evidence-based reporting on a range of high-level datasets to inform policy decisions. Examples include the Quality of Life survey that covers topics such as health, lifestyle, community, local services and public perception of living in Bristol. The final report contains 50 indicators and analysis of almost 6 000 comments about the changes residents want to see. Since June 2020, the Team also releases a new Strategic Intelligence bulletin with reports including Ward Profiles (containing datasets on population, health, education, crime and quality of life), Key Facts (major facts and infographics about life in Bristol), etc.
- Through data analysis and resident feedback, the Department of Human Service Programs (DHSP) in **Cambridge, MA, United States,** identified that their preschool enrolment waitlist practices were not providing equitable opportunities for all families. To correct this, DHSP implemented a lottery system for the 2020-21 school year and increased the scholarship fund for qualifying families, allowing them to offer 40% of available seats to families with household incomes at or below 65% of the U.S. Department of Housing and Urban Development median income for Cambridge, even though this group only made up 29% of the lottery applicant pool.
- **Curridabat, Costa Rica,** put in place a tailor-made monitoring system to assess the progress of its ecosystem services. The assessment is part of Curridabat's Sweet City vision – a new model of urban planning to bring nature and biodiversity back to the city's centre. Further, Curridabat tries to assess citizen engagement, to understand their needs and find better ways to communicate with residents. The city also designed and tested a survey on perceived happiness, which serves as one of the metrics to assess residents' well-being.
- **Montgomery, AL, United States,** introduced new software to identify and prevent blight, which draws insights from sources such as census data, utility data, building permits, housing code enforcements and 311 services. The programme enhances municipal staff's capacity to single out vacant and abandoned properties, and shorten the process to remediate these properties.
- **Philadelphia, PA, United States,** improved enrolment in the Philadelphia Senior Citizen Water Bill Discount Program by 15% with data-driven outreach. More than USD 125 000 went back into the pockets of eligible seniors.

- **Seattle, WA, United States,** designed and executed a randomised control trial to test the effectiveness of communications aimed at tackling defaults on parking tickets and traffic camera citations. Data analysis showed that about 40% of parking tickets and traffic camera citations were defaulted on, and about 25% were eligible for debt collection. The randomised control trial demonstrated a 13% reduction in the likelihood of tickets defaulting and a 9% reduction in the likelihood of tickets ending up in debt collection, and the city implemented the new communications for the 600 000 tickets issued annually. At scale, initial results showed that, over the year, the new communications would lead to about 22 000 drivers – over a third of whom are people of colour – avoiding debt collection for an unpaid ticket.

Source: OECD/Bloomberg Philanthropies (2020), Survey on Innovation Capacity in Cities; What Works Cities (WWC) Certification.

Thus, data-driven assessment can increase public accountability by providing a tool for residents to hold governments responsible for budget and policy choices, and for governments to make adjustments based on tangible outcomes. But a significant gap between the interest in and measurement of local governments' activity deprives the public of a data-driven accountability system. Such data could lead to policy learning, improvements to implementation of innovative programmes, and comparative analyses that identify the propensity for innovation across policy sectors, geography and city size.

Data governance framework for data-driven municipal governments

Data governance is a critical aspect of a data-driven government, and a good governance framework can help promote a common vision, formulate a coherent strategy and enhance the technical capacity to leverage data for residents' well-being. Data governance is not a technical or operational undertaking as much as a strategic and holistic framework considering every step of the government data value cycle, from collecting to processing, storing, publishing and using data. It also facilitates data sharing within and beyond the organisation, maximising the public value derived from the use and re-use of data.

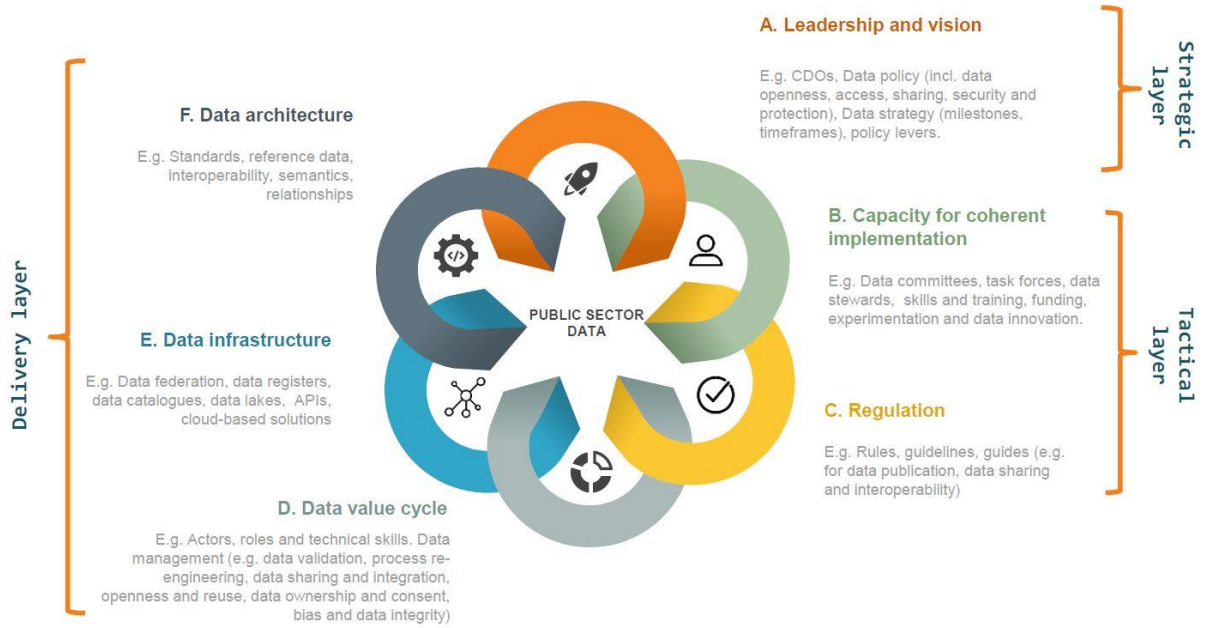
Many organisations have data governance elements in response to technical and operational data challenges. However, fragmented elements can remain disjointed, contributing little to the strategic transformation of the organisation. Besides technical elements to ensure data interoperability and standards, an effective data governance framework also provides enabling conditions for the systematic and institutional use of data for problem solving and decision making. Most importantly, a data governance framework can lay a foundation for a public policy continuity that enables the organisation to move forward after changes in political leadership and administration.

At the national level, most OECD governments grapple to establish a framework that allows them to maximise the potential of data (OECD, 2019[9]). The OECD (2019[9]) notes that "data governance elements are often in place as part of broader digital transformation policies. However, these components can be fragmented, thus reducing their whole-of-government value in terms of public sector integration and cohesion." For example, as part of the transformation into a data-driven and digital public sector, many OECD countries introduce regulations, standards and strategies for data management, digital government, open data or artificial intelligence. However, these tend to fall under fragmented governance arrangements, partly because different public sector organisations oversee different aspects of data. The fragmentation of internal organisation and governance hinders the integration and management of data. Fragmentation also stems from "legacy challenges in terms of what organisation generates and controls the data and the impossibility of sharing and accessing those data in light of specific legal arrangements." (OECD, 2019[9]).

Recognising the range of national approaches, *The Path to Becoming a Data-Driven Public Sector* (OECD, 2019[9]) proposed a common framework for public sector data governance to clarify and standardise the concept and facilitate its effective implementation across countries. The framework builds on earlier versions in OECD digital government reviews such as *OECD Digital Government Review of Norway* (OECD, 2017[34]), *OECD Digital Government Review of Sweden* (OECD, 2019[35]), *OECD Digital Government in Peru* (OECD, 2019[36]) and the *OECD Digital Government Review of Argentina* (OECD, 2019[37]). Drawing on the OECD's experience in digital government and government data, and extensive literature on data governance, the national framework organises (non-exclusive) data governance elements into six groups in three layers (Figure 3.5):

- **Strategic layer, including (A) Leadership and vision**: The strategic layer regards data strategies and leadership roles as essential elements of good data governance. The framework purports that data strategies help ensure transparency and define leadership, expectations, roles and objectives.
- **Tactical layer, including (B) Capacity for coherent implementation, and (C) Regulation:** The tactical layer draws on the public sector's data skills, competencies, funding, collaboration and partnerships to generate public value from data. It also emphasises the importance of institutional networks, both formal and informal. The other group in this layer touches on the regulatory aspects of data, from technical and organisational standards to compliance with data-related rules and guidelines to ensure openness, protection, transparency and accountability.
- **Delivery layer, including the (D) Data value cycle, (E) Data infrastructure and (F) Data architecture:** The delivery layer deals with daily implementation of organisational, sectoral, national and cross-border data strategies. This layer concerns technical and policy implications stemming from actions undertaken by different actors at various stages of the data value cycle. The delivery layer also touches on data infrastructure (i.e. adopting or adapting technological solutions such as APIs, cloud-based services, data lakes) and data architecture (e.g. standards, interoperability, semantics, etc.) to help public sector organisations achieve objectives defined in the strategic layer.

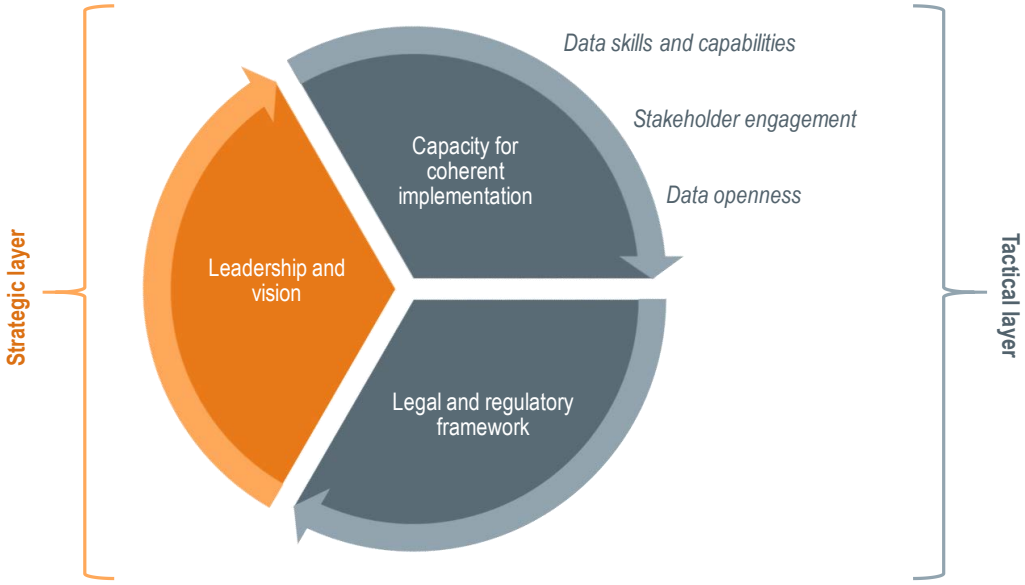
Figure 3.5. OECD framework for data governance in the public sector



Source: OECD (2019[9]) *The Path to Becoming a Data-Driven Public Sector*, https://dx.doi.org/10.1787/059814a7-en.

A well-conceived framework reconciles structure with agility. Besides providing a common language to gauge and benchmark progress, the OECD framework leaves ample room for "flexibility and scalability in order to avoid fragmentation; promote integration; and increase the adoption of good governance practices across organisations, levels of government, policy areas, sectors and border" (OECD, 2019[9]). While this framework initially meant to explore data practices from the national perspective, it holds potential and relevance for the sub-national level, where local governments seek to develop a comprehensive, coherent approach to data governance. These data governance elements are neither prescriptive nor exhaustive. Depending on organisational culture, local context and inherent challenges, municipalities might adopt or adapt them to realise their policy objectives. Applying a local lens to the previous framework, the framework tailored for data governance in the local public sector (Figure 3.6) aims to give municipalities a structured and holistic approach, as local governments often grapple with which areas to prioritise or how to embark on such journey. Certain domains and sub-domains of the tailored framework touch on data use practices in cities similar to those identified by the What Works Cities (WWC) Assessment programme. Therefore, we use survey results (as of April 2020) from the WWC Assessment programme to illustrate cities' practices in leveraging data for city administration, policy design and evaluation.

Figure 3.6. A tailored framework for data governance in the local public sector



Source: Author's adaptation from OECD (2019[9]), *The Path to Becoming a Data-Driven Public Sector*, OECD Digital Government Studies, https://doi.org/10.1787/059814a7-en.

Leadership and vision

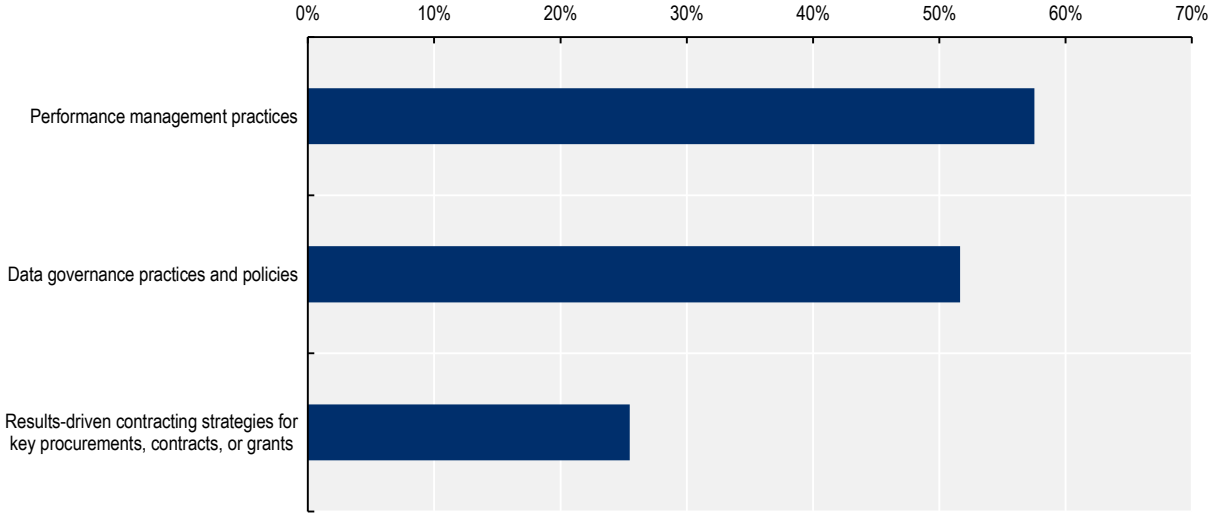
Political leadership from mayors and elected officials is key to a culture that recognises data as a strategic asset to be enhanced, leveraged and shared, both across departments inside the administration and with external stakeholders. Data-driven governments value transparency and evidence-based decision making as their institutional priority. They are convinced of the potential value derived from data and data analytics, and seek to use these insights to guide their decisions. In recognizing that leadership is key, many data governance frameworks seek to reaffirm this prerequisite for local governments to maximise the use of their data. Convinced leadership can provide both the necessary financial commitment and the political

support to overcome institutional resistance and silos between city agencies, enabling data initiatives to be maintained and even scaled up in a sustainable manner. More importantly, political leadership sets a vision and aspiration for ambitious data work, and long-term strategies to realise these goals.

Communicating and demonstrating the organisational focus of data-driven governance to municipal staff and external partners is essential, but the practice is not yet widespread in city leadership. The WWC Assessment shows that only 33% of mayors or chief executives communicate and demonstrate to staff that governing with evidence is an organisational expectation. Insufficient institutional backing can result in local public sector organisations adopting a risk-averse attitude towards data. The report written by the Auditor General for Wales, United Kingdom (2018[15]), found that many municipal governments "lack a vision, strategy or plan for improving data and are not clearly articulating what they need to do to improve." Without a vision and strategy, data initiatives are left to individuals or disparate teams to navigate and push through the organisational resistance commonly found in local governments.

Because leadership empowers data-driven culture, a designated data leader and/or team can accelerate this transformation. At the national level, many OECD countries institutionalise the role of data stewardship within central/federal governments and across ministries. From a 2017 survey of OECD countries and partner economies, 11 out of the 34 mentioned that their central/federal government have a Chief Data Officer (CDO). At the sub-national level, similar functions are increasingly present among city governments and local public sector organisations over the past years (Figure 3.7). As of April 2020, among cities in the WWC Assessment programme, 58% have a data leader and 52% a team for developing and implementing performance management practices and data governance policies. When it comes to applying results-driven contracting strategies to upcoming procurements, contracts and/or grants citywide or within departments, cities also increasingly adopt the practice, with 25% of assessed cities putting in place a designated leader/team for the task.

Figure 3.7. Cities are increasingly designating leaders and/or teams for data policies and practices



Note: Out of 153 cities participating in the WWC Assessment programme as of April 2020, 88 cities meet the criterion for "Your local government has a designated leader and/or team responsible for developing and implementing citywide performance management practices" and 79 cities meet the criterion for "Your local government has a designated leader and/or team responsible for developing and implementing citywide data governance practices and policies". Meanwhile, only 39 cities meet the criterion for "Your local government has a designated leader and/or team responsible for applying results-driven contracting strategies to its portfolio of upcoming key procurements, contracts, and/or grants citywide or within departments".
Source: WWC Certification Database.

The creation of these roles to co-ordinate, synchronise and structure policy goals can build a more mature data-driven public sector (OECD, 2018[38]). Regardless of the levels of government, a designated leader and data team can spur interest in data use across organisations. Depending on the organisation, their responsibilities may vary from administratively managing data and related infrastructure to strategically enhancing the capacity of data analytics to improve well-being outcomes for residents; from establishing technical and organisational standards to ensuring compliance with data governance frameworks.

Besides knowledge creation, data leaders are often tasked with enhancing capacity for more systematic and extensive use of data. Though senior managers and municipal staff may be convinced by the public value derived from data use, many are not equipped with basic technical literacy and approach data use in a restrained manner. Some data leaders put in place city-wide data literacy training or help departments evaluate the effectiveness of their performance or interventions. One-third of cities participating in the WWC Assessment programme offer training to all local government staff on how to use data and evidence for decision making. For example, Enschede, Netherlands, invests in data awareness to facilitate internal data sharing, breaking down silos across departments (according to the OECD/Bloomberg Philanthropies Survey on Innovation Capacity 2020).

In short, a data leader ensures that an organisation approaches each stage of the government data value cycle in a strategic, efficient, user-friendly and compliant manner. In a report on the role of CDOs for the IBM Center for the Business of Government, Wiseman (2018[39]) enumerates various activities undertaken by CDOs and their peers who work on data (Table 3.2). While these are categorised based on their implications for either internal administration or external stakeholders, they tend to be “complementary and mutually reinforcing” (Wiseman, 2018[39]). For example, the quality of open data is largely determined by relevant data governance frameworks regulating the format, documentation and standards of published data sets.

Table 3.2. Governance, infrastructure and related activities of Chief Data Officers (CDO)

CDO functions focused on the organisation	CDO functions focused on business users	CDO functions that span boundaries
Data infrastructure • Establish and maintain data warehouses • Master data management **Data governance** • Government-wide standards and policy • Data quality • Stewardship across the organisation • Data privacy and security tools and policies	**Data analytics** • Descriptive statistics • Predictive models • Data visualisation and dashboards • Training/data Literacy **Tool/skill training for data staff** • Capacity building for leadership and decision makers • Community of practice • Self-service data analysis **Platforms/tools** • Provisioning of common tools • Support of tools **GIS/mapping**[1] • Service coverage maps, gap analysis • Hot spots, interaction and overlap	**Open data** • Publish large volume of high-quality data • Establish and share meta data and data dictionaries • Regularly update and improve quality • Developer APIs **Smart technology** • Sensors • IoT and connected devices **Digital services**[1] • User-centric design for high volume transactions • Ease of access to information • Robust civic engagement

Note: 1. Tasks sometimes done by CDO and sometimes by other innovators.
Source: Wiseman (2018[39]), *Data-Driven Government: The Role of Chief Data Officers*, http://www.businessofgovernment.org.

Note that the designated data leader might go by titles other than CDO, such as Chief Data Scientist, Chief Data Analyst or Chief Information Officer. The role may also be embedded in or merged with other portfolios, leading to a variety of designations, including Head of ICT, Director of Innovation and Performance, Director of Statistics Office, Open Data Lead or IT Manager. While the responsibility of data leaders begins with data management and analytics, their designation may signal the organisation's approach and priority areas for data use. For example, the Auditor General for Wales (2018[15]) found that many local governments in the country regard data leadership as either technical or legal in nature and assign the portfolio to the Head of ICT or Senior Information Risk Officer accordingly. Indeed, the role of data leadership is different from that of data administration. Data stewardship should not fall under the exclusive purview of IT or legal departments since it demands a strategic approach across dimensions including technical capacity, regulatory and legal frameworks, and organisational culture most importantly. Even though specialist experience and technical skills might be relevant, those positions might not serve as a fervent advocate seeking to transform the organisational culture and influence institutional attitudes towards a strategic use of data.

The Data Excellence Strategy for the City of Vienna (Austria), published in March 2019, represents a strong example of weaving strategic data use into the fabric of city administration. Vienna considers data the foundation for information and knowledge, essential to creating a "smart, intelligent and digital" metropolis. Its Data Excellence Strategy includes all necessary measures for the timely provision of reliable data that meets set quality standards, allowing the city to "provide reliable information and data as a central value of an open administration of the future," thus creating benefits for residents, the economy, and science. Part of this commitment is the "Open by Default" guiding principle, requiring the city administration to open up publicly classified data, documents, and services in a machine-readable format and free of charge. (Digitales Wien, 2019[40])

Capacities for coherent implementation

Data skills and capabilities

Data skills and capabilities enable the public sector to develop insights for a variety of purposes. Data is extracted to measure, monitor, evaluate and assess a range of public policy, from programmes to services and experiments. From strategic planning to daily operations and targeted interventions, local governments rely on evidence derived from data to guide their decisions. Data are proactively gathered and integrated from sources across municipal agencies and non-governmental bodies to provide the city administration with a holistic picture.

Focusing on impact measurement, a mature, data-driven local government identifies how data can help evaluate the performance of city agencies and municipal services. Corrective changes based on insights derived from these data are taken to ensure a more efficient allocation of resources and continuous progress. Municipalities also put in place an organisational culture where experiments are conducted to optimise programmes that improve outcomes for residents. For every important decision, there should be actionable insights. In other words, municipal government should take advantage of data and analytics to anticipate future trends and risks, improve public service delivery and drive decision making (see "Unlocking the value of data for the local public sector").

Nevertheless, the list above serves more as an aspiration rather than an expectation for many local governments. Besides organisational culture related to data use, the extent to which these activities are undertaken depends on factors such as the municipal staff's commitment and internal capacity, and familiarity with and sophistication of data analysis, among others.

Box 3.7. The Lab@DC's role in designing policy and programme interventions

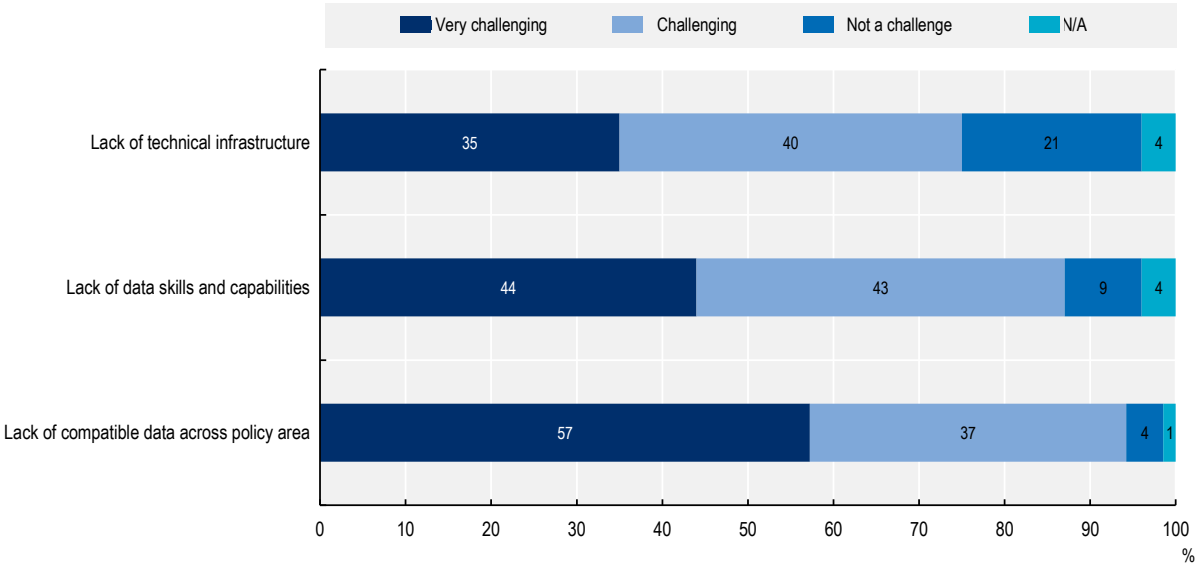
The Lab@DC is a scientific team in the administration of the Mayor of the District of Columbia (DC), United States. The Lab@DC, in collaboration with various District agencies, leverages data and scientific methods to test, evaluate and improve public policies. To maximise the impact of their programmes, the Lab@DC uses a combination of approaches/methods such as randomised control trial, predictive modelling, resident-centred design and administrative data analysis.

From 2015–2017, the Lab@DC collaborated with the Metropolitan Police Department to explore whether police officers' body-worn cameras (BWC) improved police-community interactions. Between June 2015 and December 2016, half of duty patrol and station officers were randomly assigned to wear BWCs, while the other half went without BWCs until December 2016. Outcomes were tracked until March 2017 using administrative data on documented police uses of forces, civilian complaints, policing activity and court outcomes. The study found that having a BWC had no substantial effect on police use of force, civilian complaints, policing activity or court outcomes. The results challenge conventional beliefs that BWCs can deter negative behaviours during police-community interactions. Such findings led to the implementation of new programmes aimed at improving police-community interactions such as a training that teaches the history and cultural context of DC. The Lab@DC is also evaluating the effectiveness of these new programmes.

Source: The Lab@DC (n.d.[41]), http://thelabprojects.dc.gov/.

City governments' ability to govern with data relies on their capacity to draw insights from data. Despite recognising data as an asset, many cities still cannot adequately exploit it. Cities admit that they "need tools and expertise to close the gap between their intentions to use data in decision making and their actual capacity to do so" (What Works Cities, 2015[42]). According to a What Works Cities survey of US cities, 70% are committed to using data and evidence to make decisions about city programs, but only 28% modify existing programmes based on the results of data and evaluations (What Works Cities, 2015[42]). The main challenge for cities is to "build the requisite capacity and skills for collecting, storing, and analysing data in a depth and at a scale that are unprecedented, in addition to acquiring the infrastructure and computing power needed to store and process all the data." (OECD, 2015[1]). Indeed, Figure 3.8 shows that limited data capacity hamper municipal efforts to optimise data, with 87% of cities lacking staff to support government innovation efforts and other activities (44% and 43% of these cities indicated the lack of staff to collect, store or analyse data as "Very challenging" and "Challenging" respectively). Edmonton, Canada, admits that high demand for skilled analysis – exceeding the capacity of in-house staff to collect, process, analyse and make sense of the massive datasets – has held back the city's data use efforts.

Figure 3.8. Lack of data compatibility, staff capabilities and infrastructure challenge data use



Note: Out of 147 participating cities for both OECD/Bloomberg Philanthropies surveys, 138 responded to question "Which factors are the most challenging and prevent your municipality from optimising its use of data to support innovation goals?" Shown are some of the options that surveyed cities were asked to rank on a scale from 1 to 3 (1 = Very challenging, 2 = Challenging, 3 = Not a challenge, and N/A for "don't know").
Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

No single toolkit or strategy exists to enhance all municipal staffs' data analytics capacity. Any activity would require one or a combination of types of data analysis, and thus varying data capabilities and skills. Some municipalities might be more interested in conducting randomised control trials to evaluate the effectiveness of targeted interventions and how to iterate them for better results. Others might be more concerned with results-driven contracting, conducting performance analysis for procurements, contracts and grants for either continuous or future improvement. Analysis can range from descriptive statistics to predictive models focused on forecasting and foresight, from simple stocktaking and data visualisation to advanced prescriptive analytics directly driving decisions. This needs local governments to be more proactive in identifying the skills gaps required for programmes and policy objectives.

While a dedicated data team and/or specialist staff might be entrusted with specific data analysis tasks, this does not negate the need for data literacy among non-specialist staff within the organisation. Best practices suggest that non-specialist employees should be able to understand how key decisions are made based on knowledge derived from data and communicate these findings to external partners and residents. Municipalities with more advanced data use capabilities can also provide partners (e.g. grantees, civic society, contracted vendors, etc.) with data literacy and skills training, conveying the expectation for data-driven and evidence-based governance. Once cities develop their capacity for data analysis, the insights from fine-grained data can enable municipal government to "better target infrastructure investments, deliver tailored public services and increase efficiency in operations and maintenance." (OECD, 2015[1])

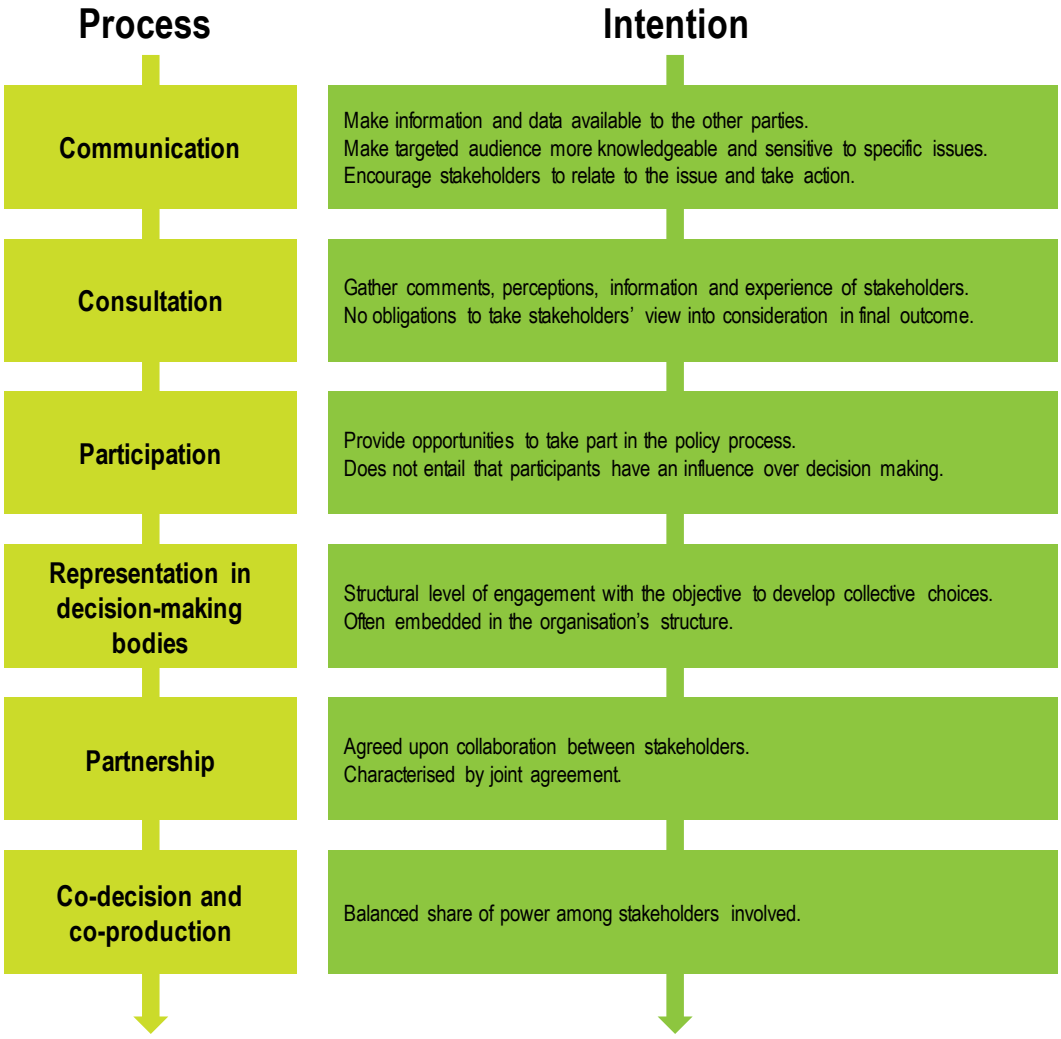
Even though the need to enhance data skills and capacity for municipal staff is universally acknowledged, it is not always addressed. Even though data analytics is valued as a core competence, many local governments consider the time and financial commitment for data training a significant obstacle given that professionals with data analytics skills are highly sought after by the private sector. This aspect of building data capacity can pose a particular challenge for small and mid-sized cities with tight budgets, diminished employment pools and limited access to partnerships. While the lack of data-related skills is common across sectors, it particularly affects stakeholders' trust in the public sector's capability and impedes their willingness to provide data.

Stakeholder engagement

Stakeholder engagement processes reveal the motives and activities of actors in both formal and informal institutional networks, which provides clarity, facilitates co-ordination and fosters trust. In this context, stakeholder engagement involves local governments' efforts to include individuals and organisations concerned by data use in the processes of consultation, decision making and implementation. It should be noted that the community of stakeholders is diverse, having different and sometimes conflicting interests. Stakeholders can range from different levels of government, to residents (or service users), civil society and the private sector (e.g. enterprises, data-dependent start-ups, government-contracted companies, data providers, etc.). Understanding their characteristics would allow governments to adopt "more differentiated approaches to data access and sharing and a more effective management of the associated risks and incentives mechanisms." (OECD, 2019[4]).

Depending on intentions, engagement with stakeholders can take different forms for various aspects of data use. The OECD (2015[43]) characterises the government-initiated stakeholder engagement process as a continuum of mechanisms that progresses from communication of information to "more intensive decision making where stakeholders exercise direct authority over the decisions taken". The first level, communication, takes passive forms of information sharing and awareness raising. The sixth and most involved level of stakeholder engagement is co-production and co-decision, which entails a balanced share of power between actors over decision-making. Even though each level of stakeholder engagement can serve a different purpose and result in different impacts, collaborative and inclusive engagement helps governments identify priorities and address gaps in data policy and capability. Stakeholder engagement can inspire confidence that data systems and initiatives are working for the interests of society.

Figure 3.9. Levels of stakeholder engagement



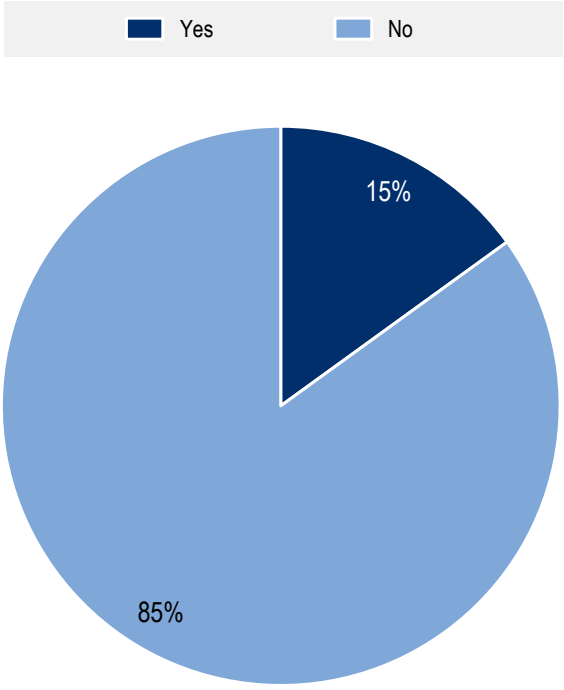
Source: OECD (2015[43]), *Stakeholder Engagement for Inclusive Water Governance*, OECD Studies on Water, https://dx.doi.org/10.1787/9789264231122-en.

Besides communicating to external stakeholders about the benefits of these initiatives, many municipal governments try to build a community of data users and contributors to promote the values of sharing and re-using open government data. For example, for open government data, public organisations at all levels recognise that success relies on external stakeholders' adoption of initiatives. Apart from making available a greater amount of open data online and maintaining user-friendly application programming interfaces (APIs), cities provide clear how-to guidance to help users access and utilise government data in a more effective manner. Many also gather information and seek feedback from open data users or track their applications to incorporate insights into the re-design and improvement of existing portals.

A vibrant community of open data users generates social and economic impacts from open government data and fosters trust in public institutions. As of April 2020, only 28 out of the 153 local governments in the WWC Assessment programme engage data users for the purpose of creating, revising, and/or improving the local government's open data policies and practices. The number is higher for cities inviting community members to use public data to solve pressing community issues: 45 cities provide a process

for partnership and collaboration with data users. However, only 23 cities (15%) meet both criteria for engaging open data users (see Figure 3.10).

Figure 3.10. Few cities have proactively and meaningfully engaged open data users



Note: Out of 153 cities participating in the WWC Assessment programme as of April 2020, only 23 cities meet both the criteria for "Your local government provides a clear process for partnership and collaboration with data users for the purpose of creating, revising, and/or improving the local government's open data policies and practices" and "Your local government provides a clear process for partnership and collaboration with data users for the purpose of inviting community members to use public city data to solve pressing community issues".
Source: WWC Certification Database.

Stakeholder engagement processes can be resource-intensive in terms of both time and finance. Out of the approximately GBP 1 million that Transport for London, United Kingdom, spends annually on publishing open data, a sizeable portion goes to maintenance and engagement of communities of data users (Deloitte, 2017[44]; OECD, 2019[4]). This could explain why out of the 73% of cities from the WWC Assessment programme that publishes open data, only 35% go the extra mile to guide potential users in how to access and use these data.

Table 3.3. City governments that publish open data and/or provide how-to guidance to use city data

	Open data	No open data
Guidance to use city data	Arlington (TX), Asheville (NC), Athens-Clarke (GA), Austin (TX), Baton Rouge (LA), Birmingham (AL), Boston (MA), Boulder (CO), Buffalo (NY), Cambridge (MA), Cary (NC), Charlotte (NC), Chattanooga (TN), Chula Vista (CA), Cincinnati (OH), Detroit (MI), Durham (NC), Evanston (IL), Fayetteville (NC), Fort Collins (CO), Gilbert (AZ), Halifax (Outside of US), Helsinki (Finland), Irving (TX), Kansas City (MO), Little Rock (AR), Los Angeles (CA), Louisville (KY), Madison (WI), Memphis (TN), Mesa (AZ), Moorhead (MN), Philadelphia (PA), Phoenix (AZ), Pittsburgh (PA), Portland (OR), Quito (Peru), Saint Paul (MN), Salinas (CA), San Diego (CA), San Francisco (CA), San Jose (CA), Scottsdale (AZ), Seattle (WA), South Bend (IN), St. Petersburg (FL), Syracuse (NY), Tempe (AZ), Topeka (KS), Victorville (CA), Virginia Beach (VA), Washington (DC), Winnipeg (Canada).	
No guidance to use city data	Adelaide (Australia), Albany (NY), Albuquerque (NM), Anchorage (AK), Atlanta (GA), Baltimore (MD), Bellevue (WA), Bloomington (IN), Calgary (Canada), Cape Coral (FL), Chapel Hill (NC), Charleston (SC), Chelsea (MA), Corona (CA), Dallas (TX), Denver (CO), Fort Lauderdale (FL), Fort Worth (TX), Gainesville (FL), Glendale (AZ), Greensboro (NC), Hartford (CT), Honolulu (HI), Houston (TX), Independence (MO), Indianapolis (IN), Jackson (MS), Jersey City (NJ), Johnson City (TN), Lancaster (PA), Lansing (MI), Laredo (TX), Lincoln (NE), Long Beach (CA), Longmont (CO), Miami (FL), Minneapolis (MN), Montgomery (AL), Naperville (IL), New Orleans (LA), Norfolk (VA), Oklahoma City (OK), Olathe (KS), Providence (RI), Rancho Cucamonga (CA), Reno (NV), Reykjavik (Iceland), Rochester (NY), San Antonio (TX), San Pedro Garza Garcia (Mexico), Santa Monica (CA), Shreveport (LA), Sioux Falls (SD), Somerville (MA), St. Louis (MO), Tacoma (WA), Tulsa (OK), West Midlands (Birmingham, United Kingdom), Wichita (KS).	Accra (Ghana), Aurora (IL), Bethlehem (PA), Bratislava (Slovakia), Chamblee (GA), Charleston (WV), Cheyenne (WY), Columbus (GA), Columbus (OH), Dayton (OH), Downey (CA), El Paso (TX), Gilroy (CA), Great Falls (MT), Gresham (OR), Holyoke (MA), Huntington (WV), Kalamazoo (MI), Kent (WA), La Crosse (WI), Manchester (NH), Newark (NJ), New Haven (CT), Palmdale (CA), Parkland (FL), Paterson (NJ), Portland (ME), Pueblo (CO), Racine (WI), Rochester (MN), Rocky Mount (NC), Roswell (GA), Santa Fe (NM), Saskatoon (Canada), Thousand Oaks (CA), Toledo (OH), Trenton (NJ), Vancouver (WA), Walnut Creek (CA), Wheaton (IL), Worcester (MA).

Note: Out of 153 cities participating in the WWC Assessment programme as of April 2020, 53 meet both criteria "Your local government publishes open data to a central, public online location." and "Your local government provides clear how-to guidance to help residents access and use city data."
Source: WWC Certification Database.

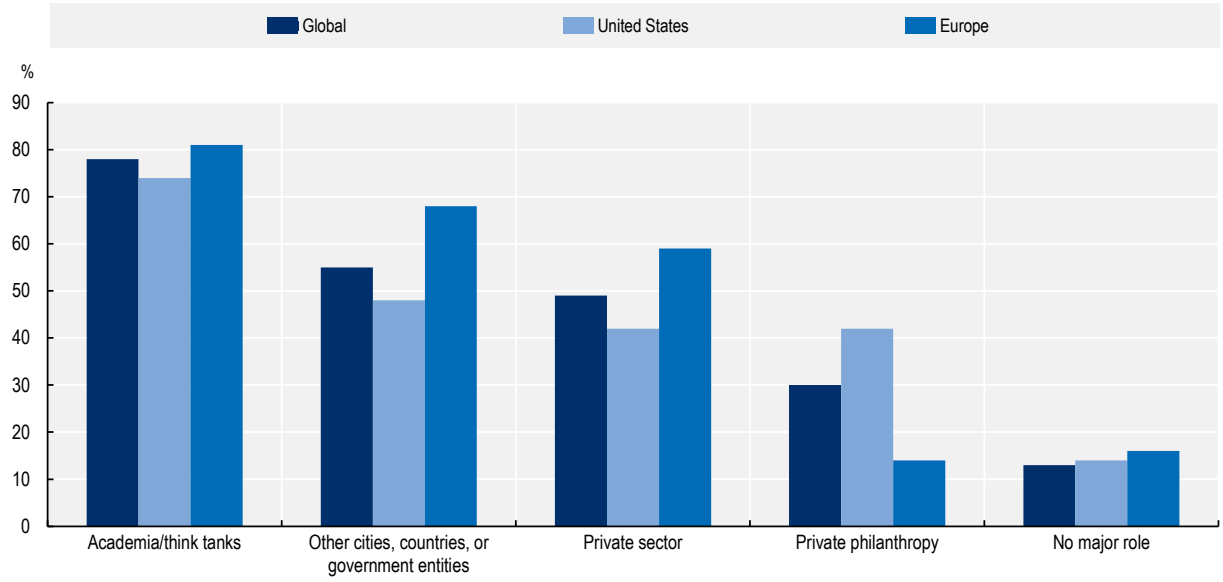
Engagement of data users can take an intensive and collaborative form of challenges or hackathons: competitive events where programmers, designers, data scientists, experts and interested individuals in various domains leverage government data to propose innovative technology solutions, an improve existing software and algorithms. Hackathons have proven to be a creative and useful method for governments to involve the community in addressing pressing issues while balancing risks by deciding the types of data and control mechanisms accessible to participants.

Stakeholder engagement can also take the form of partnerships to enrich existing data sets, co-produce databases and benefit from pooling resources and capabilities. Many local governments try to engage stakeholders upfront during the data production and sharing stage rather than simply expecting them to use data produced by the public sector. Data partnerships, be they public or public-private, can generate value that would be impossible to create when data is confined to a single organisation. Reimsbach-Kounatze (2015[45]) notes that the use and re-use of both public and private-sector data can enhance the power and quality of statistics, especially in a global context where national surveys for data collection are losing momentum. Statistics offices and data teams can tap into various sources of non-official data held by private companies to produce more robust indicators, enrich their insights and improve their evidence-based decision making in fast-changing areas such as urban planning, crisis management, etc.

As Figure 3.11 shows, most cities take advantage of data partnerships (specifically aimed at enhancing innovation capacity). While the number vary across US and European cities, only 13% of cities surveyed report that data partnerships play an insignificant role. More than three-quarters of participating cities indicate that they collaborate with academia, think tanks and research institutions to collect and analyse

data. However, with fewer than half reporting some form of partnership with either the private sector or private philanthropy, cities may want to take more advantage of such opportunities.

Figure 3.11. Cities establish a wide range of partnership to enhance their data work



Note: Out of 147 participating cities for both OECD/Bloomberg Philanthropies surveys, 142 responded to the question "Has your municipality developed any partnerships with the aim of collecting or analysing data to fuel innovation capacity or strategy?" Surveyed cities were asked to select all options that apply. The vertical axis denotes the percentage of municipalities developing external partnerships for their data work.
Source: OECD/Bloomberg Philanthropies (2018-20), Survey on Innovation Capacity in Cities.

Public-private partnership (PPP) for data refers to long-term, voluntary agreements between the public sector (e.g. government and public agencies at various levels) and private partners to enhance the capacity to derive benefits from such data for the parties involved. Different from ad-hoc and one-off data-sharing initiatives, PPPs are characterised by "the existence of an agreement which structures, collaboration and defined roles, responsibilities and rights." (Robin, Klein and Jütting, 2016[46]). Long-term collaboration is important when longitudinal non-official data from the private sector are often required to complement traditional sources of statistics collected by the public sector. While PPPs for data and statistics have existed for quite some time, the emergence of Big Data and the private sector's ability to process it has renewed attention to public-private data partnerships.

PPPs in data and statistics can provide governments with new and granular data in a timely and cost-effective manner. Another advantage of PPPs is that a municipality cab tap into the competences, skills and technologies of partners to perform advanced analysis from holistic sources of data. Through these collaborations, city government can establish a network of stakeholders whose support and expertise can be leveraged to deepen the impact of data. Like other forms of engagement, data partnerships can be cost-intensive as joint agreements must maximise the potential of co-operation while juggling the conflicting interests of different partners. Any agreements related to PPPs for data must be pre-defined with the involved parties' responsibilities and potential liability clearly structured. In cases where institutions exchange data (especially potentially sensitive data), strong regulatory mechanisms must be in place to prevent and resolve misuse. Also, PPPs for data are a two-way process where private companies need to be convinced of the benefits of entering into these agreements.

Box 3.8. Select examples of data partnerships and initiatives developed by cities

- **Bologna, Italy,** is working with **Barcelona, Spain,** to learn from the experience of their Data Office. The cities are working to define a collaborative model of governance for data generated and managed by public and private stakeholders. Through the Fondazione Innovazione Urbana created by the municipality and the University of Bologna, the city established a Data Office involved in collection and management of data generated by the city's participatory processes.
- **Bristol, United Kingdom,** collaborated with seven local authorities (Gloucestershire, South Gloucestershire, Wiltshire, Somerset, North Somerset, Bath and North East Somerset, and Devon) to develop a digital heritage mapping resource called "Know Your Place". With access to a range of historic maps and data, "Know Your Place" lets users explore and add information about their local areas and neighbourhoods, contributing to a rich and diverse community map of local heritage for everyone.
- **Edmonton, Canada,** is part of the Metrolab network, which cultivates partnerships between universities and local governments to drive evidence-based policy and enable data and technology transformation. The city also formed partnerships with academics (especially through student projects) and with non-profit agencies (e.g. social service sectors).
- **Helsinki, Finland,** has partnerships with regional water and waste management agencies, public transport agencies and hospitals (that control a large amount of healthcare data).
- **Rosario, Argentina,** in partnership with the provincial government of Santa Fe and academic institutions, established the technological pole (Polo Tecnologico) of Rosario to nurture a culture of innovation and promote technological development locally and internationally. The city collaborates with universities (e.g. University of Gran Rosario) and non-profit civil associations (e.g. International Association of Educating Cities).
- **Tempe, AZ, United States,** in partnership with Arizona State University's Biodesign Institute, uses wastewater analytics to collect data on opioid abuse in their community and inform where to send resources on education and overdose response. The city is now working to use these practices to determine COVID-19 cases.

Source: OECD/Bloomberg Philanthropies (2020), Survey on Innovation Capacity in Cities; What Works Cities (2020[47]), *Data-Rich Sewage in Tempe, AZ*, https://medium.com/what-works-cities-certification/data-rich-sewage-in-tempe-az-77b2444a23f8; The City of Tempe (2021[48]), "Innovation in Advancing Community Health and Fighting COVID-19", https://covid19.tempe.gov.

Data openness

The What Works Cities Assessment Glossary defines open data as "electronic data records that are accessible in whole or in part to the public and are legally open without restriction on use or re-use. This practice is a form of proactive disclosure – making information available without it being requested." Open data can come from various actors in the data ecosystem such as individuals, households, private companies and public sector organisations. The degree of "openness" (which is a spectrum more than a binary) depends on how the data are generated, and which actors possess and decide to open them to wider application. Most definitions of open data establish the types of data that should be made available and lay out characteristics for "openness". For instance, data openness can be deliberated based on criteria such as accessibility, machine readability (i.e. compatible formats that make data easily retrieved and processed), costs (i.e. free of charge) and rights (i.e. free of restrictions on intellectual property rights to use and distribute) (McKinsey&Company, 2014[49]).

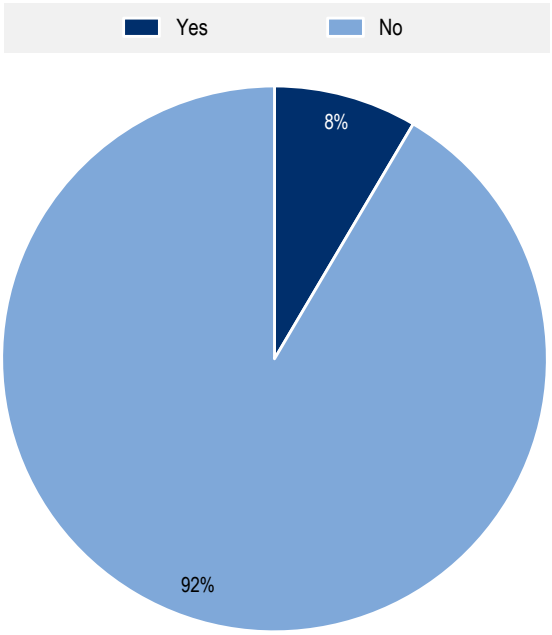
In the absence of conflicting interests, it is widely expected that public sector data be accessible as open government data. Central to such an expectation is the conviction that public sector information in government data systems, once personally de-identified, should be open to benefit society. Open data is the most prominent and widely adopted approach by governments and public entities when it comes to enhanced access and data sharing (OECD, 2019[4]). This is because the public sector is one of the most data-intensive sectors. For example, US public sector agencies stored 1.3 petabytes (PB) of data on average in 2011, making them the country's fifth most data-intensive sector (OECD, 2015[1]). By 2020, the US federal government's open data portal had published over 200 000 data sets, together with guides and other resources for users to conduct research, develop applications and design data visualisations.

In an era of declining public trust, local governments worldwide have considered the open data movement as an opportunity to foster transparency and public participation. Residents' use of open data can help "increase openness, transparency and accountability of government activities and thus boost public trust in governments" (OECD, 2019[4]).

An open data initiative that help bring to light unaccountable government activities and irresponsible public spending is the Brazilian Transparency Portal, created in 2004 to increase the fiscal transparency of the federal government. Built on a collaboration between ministries and federal organisations, the open government budget data portal discloses previously secret information on federal agencies' and government officials' expenditures, and companies blacklisted from government contracts. Since its establishment, the Portal significantly contributed to the country's anti-corruption efforts, garnering more than 900 000 unique visitors every month (Graft, Verhulst and Young, 2016[50]). More importantly, the model of open government budget data inspired transparency initiatives throughout local governments in Brazil and other Latin American countries. However, similar trends were not widely observed at the local level, especially when it comes to public contracting transparency and accountability.

As of April 2020, only 13 out of the 153 local governments in the WWC Assessment programme proactively share information about contracts, procurement, and/or vendor performance to increase bid competitiveness and ensure transparency and accountability (see Figure 3.12). Indeed, the problem with government data remains that they tend to be closely guarded, and access is granted on an ad-hoc basis. Data-sharing, be it externally or internally, faces institutional and bureaucratic resistance, leaving it undervalued, underdeveloped and underutilised.

Figure 3.12. Few cities make data available to increase bid competitiveness and strengthen procurement transparency



Note: Out of 153 cities participating in the WWC Assessment programme as of April 2020, only 13 meet the criterion for "Your local government proactively shares data, documents, and information about contracts, procurement, and/or vendor performance, in order to increase bid competitiveness and strengthen procurement transparency and accountability".
Source: WWC Certification Database.

Open government data is a step toward transparency and accountability, but the quality of data and its potential to generate public value matter at least as much as the quantity (Janssen et al., 2017[24]; Kuk and Davies, 2011[51]). Excess data is no substitute for high-quality or user-friendly data. For example, budgetary information, while being released as open data, can remain unintelligible to most concerned residents since it requires a certain level of technical understanding. Despite having a well-functioning open data portal, Bloomington, IN, United States, acknowledged that the lack of data curation and visualisation limits wider application of the service, both internally and externally (from the OECD/Bloomberg Philanthropies Survey on Innovation Capacity 2020). Therefore, the use of open data to increase government transparency can only be effective if these efforts are accompanied by "additional measures for enhancing government accountability and transparency, as well as democratic control" (OECD, 2015[1]).

Local governments should be aware that the implications of open data as "a strong focus on transparency, though essential to sustain efforts meant to strengthen overall public sector integrity and accountability, can limit the proactive release of open government data and the necessary engagement of the relevant actors in the ecosystem in data reuse for value creation." (OECD, 2018[38]). Data released out of concern for accountability might prompt governments to open data in a more passive or reactive manner. A government can open its data and remain deeply non-transparent and unaccountable. Non-discriminatory and purposeful release of local government data can help maximise the social and economic impact of these data, generating public value beyond public trust and government transparency.

Open data also presents business opportunities for other actors and stakeholders in the data ecosystem, such as start-ups and companies relying on data to develop innovative commercial and social goods and services. In a sense, this can be considered "indirect intervention" supporting economic and entrepreneurial activities "recycle" government data to produce public or social goods.

At the local level, the tangible socio-economic benefits of open data were confirmed in a 2017 (Deloitte[44]) report on Transport for London (TfL), United Kingdom. TfL's open data produced a virtuous cycle for London's transport network providers and users (e.g. GBP 130 million in economic benefits for London, TfL and its customers, and road users) as well as positive externalities such as improved air quality job creation, and a boon to the innovation ecosystem (Table 3.4). The open data provided by TfL facilitates cross-sector co-operation, allowing for better integration between transport and navigation services (e.g. integrating disparate transport modes and route planning options). Such social and economic impacts suggest that the use (and re-use) of public sector data, most prominently in the form of open government data, is a major enabling condition for open innovation.

Table 3.4. The social and economic benefits of TfL's open data

Based on data provided by TfL, the Deloitte report estimated the economic benefits and cost-savings for three core segments: passengers (all network users), London and TfL itself.

Passengers	London	Transport for London (TfL)
Saved time for network passengers • Passengers can plan their journeys with apps that use TfL's open data to provide real-time information and advice on how to adjust their routes. This provides greater certainty on when the next bus/tube will arrive and saves time – estimated between GBP 70 million and GBP 90 million per annum.	**Gross value added** • Several companies, many of whom are based in London, use and re-use TfL data commercially, generating revenue. • Total gross value added from using TfL data by these companies directly and across the supply chain and wider economy is estimated between GBP 12 million and GBP 15 million per annum.	**Savings from not producing apps in-house** • With over 13 000 registered developers, TfL allows the market to develop innovative new transport apps and services. This creates potential cost savings for TfL from not having to build apps itself or co-develop them with third-party developers.
Saved time for other road users • Data on road works and traffic incidents can feed into satellite navigation system software and apps that allow private and commercial drivers to adjust their routes and avoid congestion. • This saves time and can reduce emissions as less time is spent waiting in traffic and journeys are shorter.	**High-value job creation** • TfL open data is estimated to directly support around 500 jobs that would not exist otherwise. • Many of these jobs are in sectors associated with high productivity.	**Savings from not having to invest in campaigns and systems** • Publication of data gives passengers information directly, reducing pressure on the Contact Centre. • Undertaking an equivalent campaign to make this information available could cost GBP 1 million. Open data allows TfL to make the same data available at a lower cost, expanding customer reach and improving transparency. • The cost for TfL to publish open data is estimated at around GBP 1 million annually, suggesting a significant return on investment.
Savings by moving from SMS alerts • Passengers can switch to free apps or free web services for real-time data that use TfL's open data. • This creates a cost saving for those who previously subscribed to fee-based SMS alerts, estimated at up to GBP 2 million per annum. The use value of new real-time alert services is estimated to be up to GBP 3 million per annum.	**Wider job creation in the supply chain** • 230 indirect jobs in the supply chain and wider economy were created.	**Leveraging value and savings from partnerships** • Through partnerships with major data and software organisations, TfL receives significant data in areas where it does not collect data (e.g. crowdsourced traffic data). • This allows TfL to undertake new analyses and improve its operations.
Plus improved customer satisfaction from accurate and reliable information available instantly	**Plus supporting the wider UK Digital Economy in London and other cities**	**Plus new commercial opportunities arising from open data**

Source: Deloitte (2017[44]), *Assessing the value of TfL's open data and digital partnerships*, http://content.tfl.gov.uk/deloitte-report-tfl-open-data.pdf.

At the municipal level, open data initiatives can only live up to their potential when there is demand both within and outside the administration. The Auditor General for Wales (2018[15]) report confirms that the lack of data skills is an obstacle to maximising open data. Governments must go beyond publishing open data and develop capacity to perform the main functions of the data cycle – collecting data, opening and sharing data, combining data (i.e. ensuring compatibility), and analysing data for new insights and applications – resulting in innovation and action-oriented decision making (Janssen et al., 2017[24]). This includes the need to establish and invest in data literacy for all city staff, not just specialised teams. As discussed in "The professional background of innovation teams may reflect cities' priorities for innovation" section of Chapter 2, developing data competency across a public administration can facilitate data-driven decision-making in all aspects, making it second nature among staff and reducing skill asymmetries that create cross-departmental friction. Despite the difficulties cities face in releasing their data to increase transparency and promote data-driven innovation, the investment in open data is worthwhile.

Box 3.9. Leveraging data use for public sector innovation

Data can serve as an important input for innovation activity. Public sector organisations that seek to improve their innovative capacity should focus on three main data-related aspects:

- **Sourcing:** The identification of different types and sources of data, information and knowledge that are relevant. This may also involve explicit efforts to generate new knowledge.
- **Exploiting:** Organisations need to channel data, information and knowledge into a usable form so that it can be fully exploited to support evidence-based decision making and organisational renewal (to support the development of "learning organisations").
- **Sharing:** Organisations need to share information collected with wider sets of actors including other public-sector organisations and members of the public to support decision making, accountability and co-innovation and facilitate value creation elsewhere in the economy.

Source: OECD (2015[52]), *The Innovation Imperative: Contributing to Productivity, Growth and Well-Being*, https://dx.doi.org/10.1787/9789264239814-en.

Legal and regulatory frameworks

An important element of the data governance model, legal and regulatory frameworks range from national legislative measures to softer instruments such as guidelines and recommendations issued by various levels of government. Legal and regulatory frameworks help cities "define, drive and ensure compliance with the rules and policies guiding data management, including data openness, protection and sharing." (OECD, 2019[9]) At the same time, however, these measures might create a barrier to good data governance since fragmented, inflexible and incoherent legal and regulatory frameworks can hamper data-sharing efforts, delay data integration and impede the management of data.

It is imperative that legal and regulatory frameworks facilitate data exchange, both horizontally among city agencies and vertically among levels of government. This is because organisational siloes, which legally preclude data sharing and data compatibility, can hinder the potential of data use for timely decision making. Guidelines and instructions for horizontal and vertical data sharing can help municipalities challenge such silos in public administration and encourage co-operation among jurisdictions and other levels of government, which has "long been recognised as a crucial element of efficient and effective urban governance" (OECD, 2015[1]; Rodrigo, Allio and Andres-Amo, 2009[53]).

An effective regulatory framework that allows for a flexible data sharing agreement would embed mechanisms to strengthen co-ordination across different municipal organisations and facilitate public-

private partnerships on urban data. This would provide local governments with an opportunity to revamp and streamline internal procedures and delivery services in a transformative manner. For example, a proactive data-sharing agreement would prevent duplicate data being requested multiple times, relieving the administrative burden on both municipal employees and service users. Secondly, cross-sectoral data sharing by public sector organisations would allow data to be linked, integrated and leveraged for performance analysis and decision making.

When it comes to open government data, its success depends on the local government's ability to put in place stringent regulations to shield publicly available data from privacy and cybersecurity threats. Many local governments have guidelines and frameworks to address the security, privacy and ethical dimensions of open data. However, while a legal framework for data protection can safeguard the rights of data subjects and limit security breaches, it might inadvertently limit the flows of data and hinder local governments' willingness to open their data.

Patterns in city data use and residents' well-being outcomes

Data use is a tool for local governments to safeguard and enhance the well-being of their residents. In this sense, city practices regarding data use should be examined with respect to their potential to influence residents' well-being outcomes. As is the case for local public sector innovation capacity (see Chapter 2), the relationship between data use by city governments and residents' well-being can be complex. Some well-being outcomes, like education, facilitate the use of data, while others, like housing affordability and city satisfaction, can, in turn, be favourably affected by data practices.

This section explores the links between data use practices and well-being outcomes at the city level. It builds on the OECD well-being framework for regions and cities (Figure 1.1) and on information about data use in cities participating in the What Works Cities (WWC) Assessment. As explained in Chapter 1, the measurement of data use practices in cities relies on the WWC Standard's 45 criteria of excellence for data use in local government, grouped into eight foundational areas: Data Governance, Evaluations, General Management, Open Data, Performance and Analytics, Repurposing, Results-Driven Contracting, and Stakeholder Engagement (see Box 1.2). Information on the WWC's 45 criteria at the city level is used to create a score from 0 to 45 that captures cities' efforts in using data for city administration, policy design and evaluation.

The section first looks at how the cities that underwent the WWC Assessment are doing across 11 well-being dimensions based on their level of data use practices. It then explores links at the city level (controlling for population and economic development) between well-being indicators and the different foundational areas of data use.

The results suggest robust correlations between different data use areas – notably stakeholder engagement, open data and performance and analytics – and the well-being indicators of city and life satisfaction, educational attainment, material conditions, affordability of housing and self-reported health. While these associations do not imply causality from data use to well-being, they suggest that data use capacity tends to accompany improvements in several dimensions of people's lives.

How is life in cities with high data use capacity?

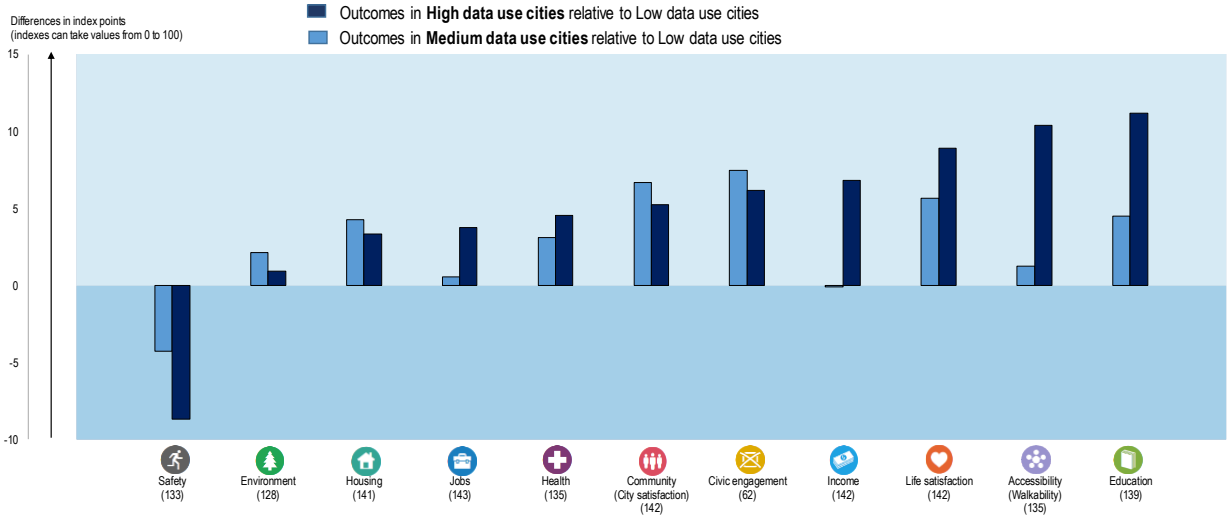
Cities with more advanced data use practices tend to show better well-being outcomes**.** Looking at 145 cities (141 US cities and 4 EU cities), high data use standards are associated with better outcomes in 10 out of 11 well-being dimensions, on average. What is more, large differences (above 4 percentage points) exist between cities with high data use standards (23–38 practices) and low (0–9 practices) in seven out of ten well-being dimensions, such as health, civic engagement, income, access to services, education, city satisfaction and life satisfaction (Figure 3.13 and Figure 3.14). The only exception to this

pattern is in the dimension of safety – measured in terms of crime rates – where cities with low data use practices display better results, on average. One possible explanation for this (although not demonstrated in this report due to data constraints) is that cities with high crime rates invest more in monitoring and data-generating infrastructure (such as cameras).

It is also worth highlighting that these results do not consider population and income effects, which tend to be associated with, both, data use practices (Annex Table 3.A.1) and well-being outcomes. The following section highlights the links between data use and well-being outcomes that remain robust even when considering city size and income.

Figure 3.13. Data use and well-being in cities: Indexes

Difference between indexes ranging from 0 to 100, where 100 is the best outcome; unweighted averages of cities



Note: High data use cities: from 23 to 38 practices; Medium data use cities: from 10 to 22 practices; Low data use cities: from 0 to 9 practices. Indicators included in the indexes by well-being dimension are listed in Table 1.1. Number of cities in parentheses.
Sources: Data used to compute the indexes comes from the American Community Survey; Gallup US Daily 2016-17; NYU Langone Health and NYU Wagner City Health Dashboard; Reflective Democracy Campaign; and WWC Certification database, 2018-20.

Figure 3.14. Data use and well-being in cities: Headline indicators

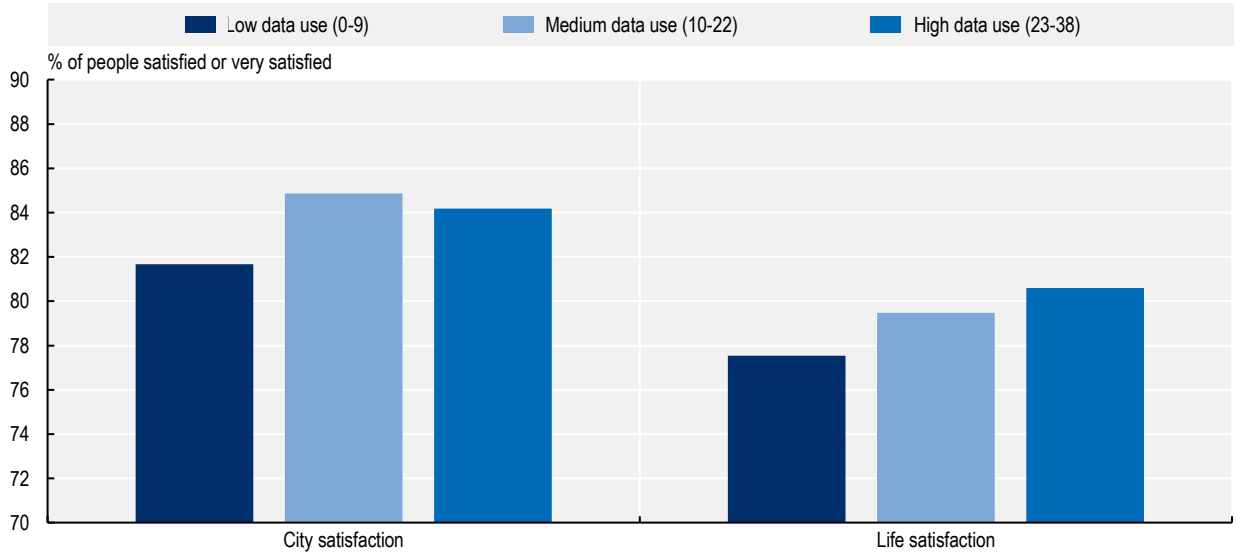
	Low data use (0 to 9)	Medium data use (10 to 22)	High data use (23 to 38)
Jobs			
Employment rate (%)	72.1	72.0	74.0
Unemployment rate (%)	6.1	5.9	6.0
Income			
Income deviation from national average (%)	6.3	6.1	17.5
Housing			
Households spending less than 25% of their income on rent (%)	79.6	81.2	80.9
Access to services			
Walkability index	45.4	46.3	52.9
Education			
Population with tertiary education (%)	34.7	37.6	41.9
Civic engagement			
Voter turnout in local elections (%)	22.9	27.5	26.7
Health			
Life expectancy at birth (years)	78.2	78.2	78.6
Population without health problems (%)	78.7	80.3	80.1
Environment			
Air pollution, particulate matter (micrograms per cubic metre)	8.3	8.2	8.3
Safety			
Violent crime rate (number of crimes per 100 000 people)	591	673	757
Community			
Population satisfied with the city (%)	81.7	84.9	84.2
Life satisfaction			
Population satisfied or very satisfied with their life (%)	77.5	79.5	80.6

Note: The table presents the average of each indicator for Low data use, Medium data use, and High data use cities, prior to the transformation into the normalised indexes presented in Figure 3.13. The units of each indicator appear in the first column in parentheses.
Sources: American Community Survey; Gallup US Daily 2016-17; NYU Langone Health and NYU Wagner City Health Dashboard; Reflective Democracy Campaign; and WWC Certification database, 2018-20.

Data use practices in cities and residents' well-being outcomes

People in cities with higher data use standards are more likely to be satisfied with their city and their life, on average. While 81% of people living in cities with high data use capacity are satisfied with their lives, only 77.5% of people in cities with low data use report being similarly satisfied with their life (Figure 3.15). The positive correlation between higher data use standards and life satisfaction persists even after controlling for city size and economic conditions (see 0), two of the factors that are likely to affect life satisfaction, among other well-being outcomes.

Figure 3.15. Data use and satisfaction with the city and life



Note: The positive association between having medium or high data use standards and life and city satisfaction persists after controlling for population and the level of economic development of the city.
Sources: Gallup US Daily 2016-17; European Survey of Quality of Life, 2019; and WWC Certification database, 2018-20.

Well-implemented data practices by city governments can positively affect several residents' outcomes related to city and life satisfaction, including health, affordability of housing and overall material conditions. Because of the interlinkages across well-being dimensions, data practices targeting a particular well-being aspect can spill over into other dimensions. For example, an open data platform that leads to the development of new apps helping residents access preventive health services can improve health outcomes, which in turn can affect life satisfaction. The findings, presented in the next paragraphs, based on a large sample of cities in the United States support the argument that data use potentially enables city and life satisfaction.

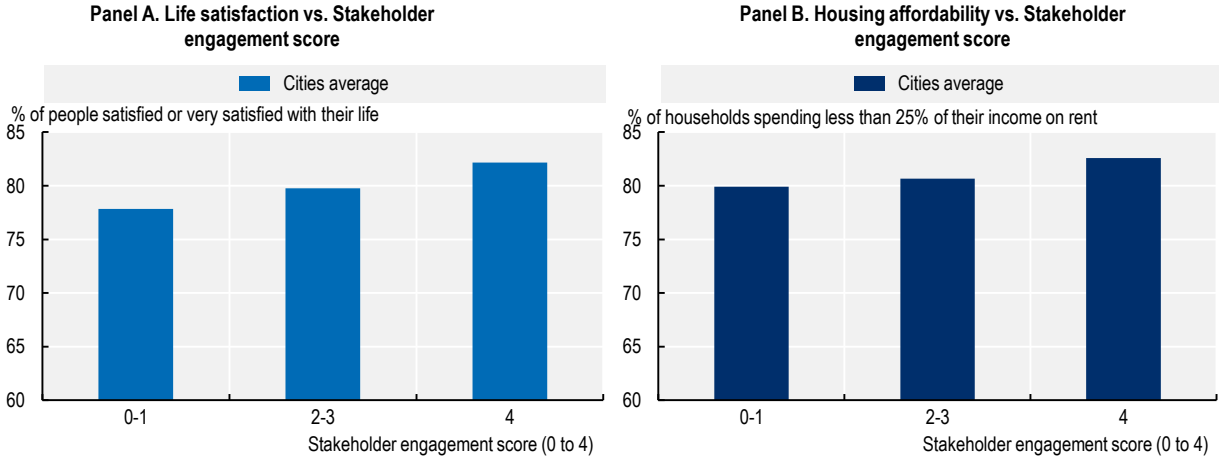
Data use practices that enhance service delivery, increase transparency and accountability of the local government, or that promote co-creation with stakeholders seem to drive many of the links observed to well-being outcomes. These practices are mainly contained in three out of the eight foundational areas defined by the WWC Standard: Stakeholder Engagement, Open Data, and Performance and Analytics.

Engaging residents to design data policies is key to better well-being outcomes. Resident engagement and feedback can help ensure continuity of innovative public projects (Arundel and Es-Sadki, 2019[54]). Similarly, stakeholder engagement activities (like civic hackathons) can help put data into public use and provide local governments with valuable information affecting future data releases and policies (Robinson and Johnson, 2016[55]). More generally, residents who have a say in the way their local governments act and use data can experience higher well-being through both subjective feelings (e.g. their satisfaction with their city, government and life) and objective outcomes (e.g. better housing opportunities) (OECD, 2015[56]).

In the cities studied, stakeholder engagement practices showed robust and positive correlations with better life satisfaction and housing outcomes (Figure 3.16). Within the WWC framework, the foundational area of stakeholder engagement captures local governments' commitment to engage with data users in the design and implementation of data policies and practices. Objective well-being outcomes, like housing, may be influenced by stakeholder engagement in data use practices if they lead to better-designed policies or to better access to government programmes (e.g. student or mono-parental aid, access to social housing). In turn, subjective well-being outcomes, like life satisfaction, may be influenced by stakeholder

engagement practices either directly, such as if exchanges with the city administration led to an increased sense of community, or indirectly, such as by improvements in interlinked objective well-being outcomes.

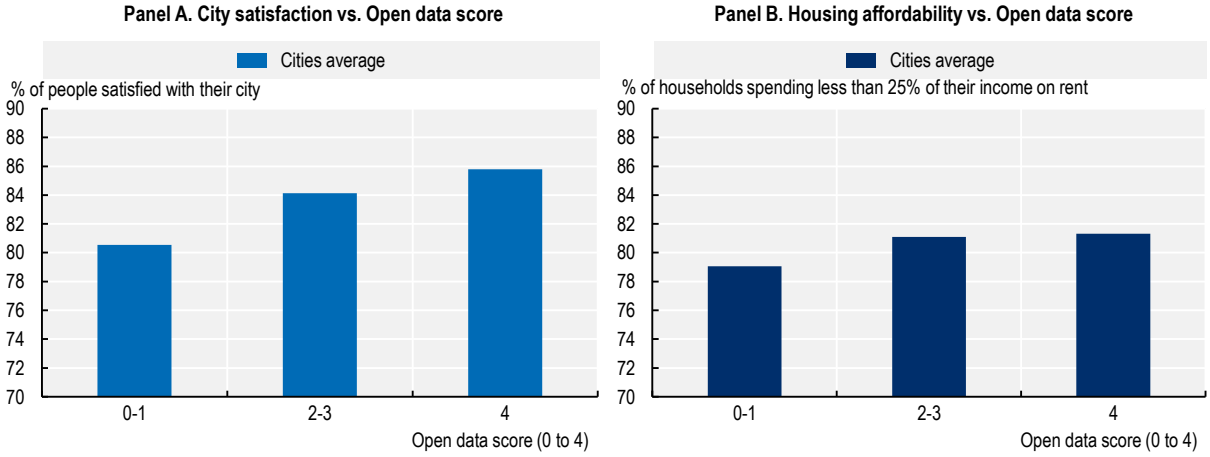
Figure 3.16. Stakeholder engagement vs. Life satisfaction and Housing affordability



Note: The housing affordability indicator looks at households without mortgages. The positive association between stakeholder engagement practices and the life satisfaction and housing affordability indicators persists after controlling for population and the level of economic development of the city.
Sources: American Community Survey; and WWC Certification database, 2018-20.

Similarly, practices that encourage and facilitate the publication of open data can improve residents' well-being. Beyond the direct value of information, open data is likely to produce positive externalities across well-being dimensions. Open data can be used to build tools that improve access to services, monitor the activities of local governments and create data products that inform residents. One of the clearest links is to city satisfaction. Local governments that engage in open data practices tend to have a higher share of residents satisfied with the city (Figure 3.17, Panel A), suggesting that residents value the increase in transparency and accountability of their local governments. Housing affordability – measured by the share of people spending less than 25% of their income on rent – also shows a positive correlation with open data practices (Figure 3.17, Panel B). Although the open data measures refer to access to data at large (not by sector), this effect could still be driven by better access to information on the housing market (e.g. supply and prices) and housing aid, including social housing. In addition, there are examples where city data on housing, particularly home ownership, leads to more targeted funding for the construction of family rental units, which subsequently improves housing affordability (What Works Cities, 2019[57]).

Figure 3.17. Open data vs. City satisfaction and Housing affordability

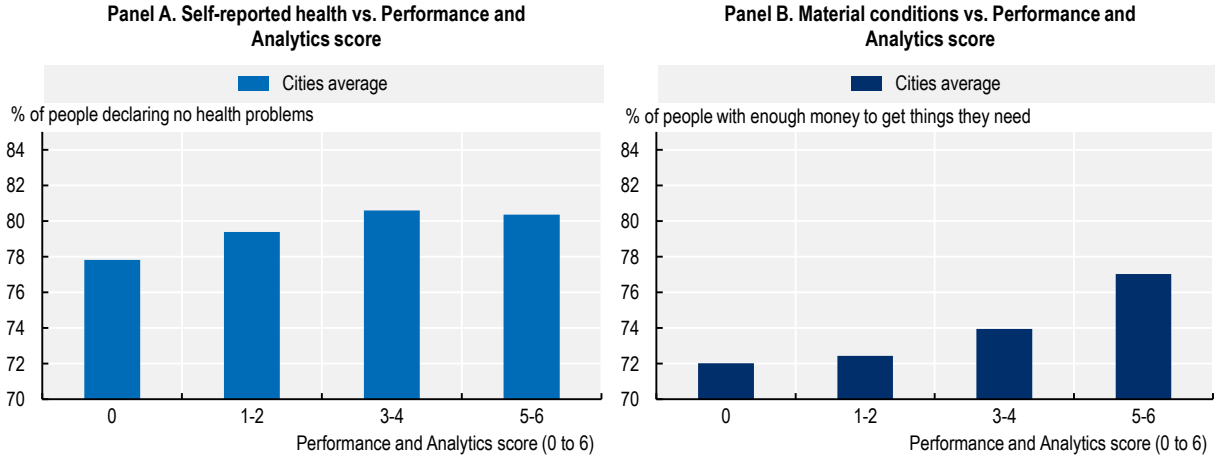


Note: The housing affordability indicator looks at households without mortgages. The positive association between open data practices and the city satisfaction and housing affordability indicators persists after controlling for population and the level of economic development of the city.
Sources: Gallup US Daily 2016-17; European Survey of Quality of Life, 2019; and WWC Certification database, 2018-20.

City governments that use data to evaluate and monitor progress toward specific goals are more likely to provide residents with better services, resulting in improved well-being outcomes such as self-reported health. The Integrated Medical Information and Analytical System (IMIAS) project in Moscow, Russia, is an example of how local governments can monitor the performance of their programmes to bring about better health outcomes (Box 3.5). The project provides authorities real-time metrics on the number of patients, waiting times, length of visits and estimated cost savings, helping satisfy residents' demand for medical services (Moscow Mayor official website, 2016[58]). This is consistent with the outcomes observed in the WWC city sample: city governments with more data use practices in Performance and Analytics had, on average, a higher share of residents reporting no health problems (Figure 3.18, Panel A). Although modest, this correlation is robust even after correcting for the effect of city size and residents' income.

Beyond the health dimension, high data use capacity in Performance and Analytics can allow residents to enjoy better material conditions through better public service delivery, even for people with the same income (Figure 3.18, Panel B). Overall, based on the analysis of sample cities, 78% of people living in cities with high standards in data use (above 22 practices) report having enough money to get things they need, compared to 73% in cities with low standards in data use (less than 10 practices). Improvement in the material conditions of residents can happen when there is monitoring and evaluation of programmes that give residents access to better public transport, affordable housing and social aid. For example, Barcelona, Spain, monitors and directs assistance to populations at risk of social exclusion and who do not have access to public aid programmes offered by the city (Box 3.6). Similarly, the London Borough of Barking and Dagenham, United Kingdom, uses predictive analytics to identify and help households at risk of homelessness (Box 3.4).

Figure 3.18. Performance and Analytics vs. Self-reported health and Material conditions



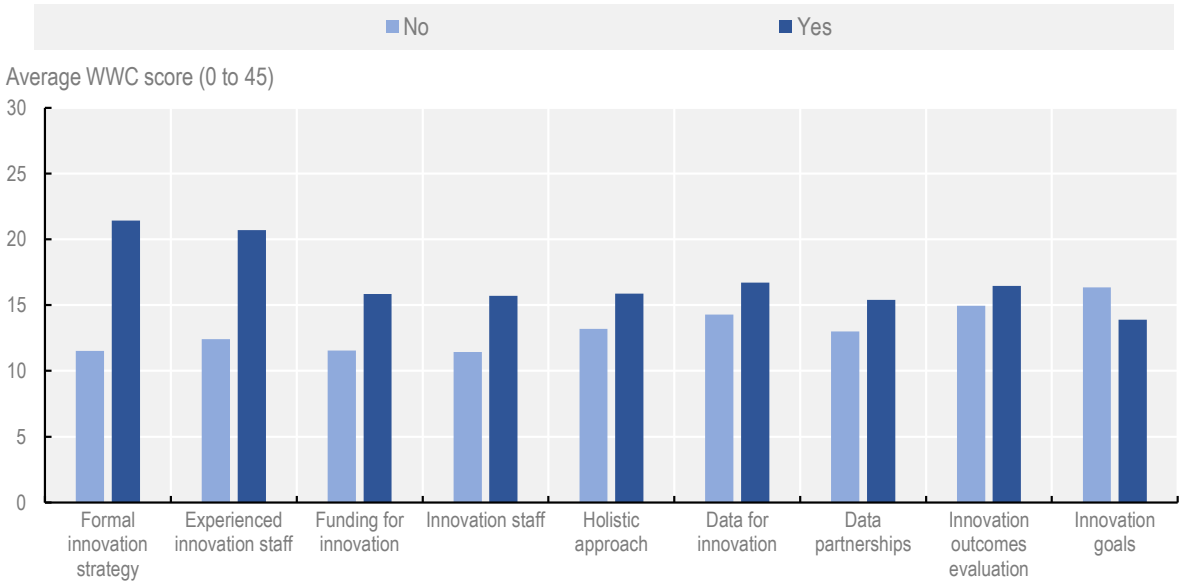
Note: The positive association between performance and analytics practices and the self-reported indicators on health and material conditions persists after controlling for population and the level of economic development of the city.
Sources: Gallup US Daily 2016-17; and WWC Certification database, 2018-20.

Combining data use and PSI capacity in cities

PSI and data use practices might go hand in hand and reinforce each other, affecting well-being outcomes such as city and life satisfaction. While previous sections examine and document the correlations between well-being outcomes and either PSI capacity (Chapter 2) or data use (Chapter 3) separately, this section provides evidence on the associations between data use and PSI practices, and on the potential reinforcing effects that combining them might have on city and life satisfaction, based on a sample of 57 cities that participated in both the OECD/Bloomberg Philanthropies Survey on Innovation Capacity in Cities and in the WWC Assessment.

Cities with a formal innovation strategy, experienced innovation staff and funding for innovation tend to exhibit higher capacity in data use at the local level. Overall, cities with good PSI practices tend to have higher standards in data use (based on the WWC score), and the correlation coefficient between the PSI and data use scores is 0.3, statistically significant at 95%. In addition, the differences in data use scores are particularly high – above 8 percentage points – between cities with and without a formal innovation strategy and a staff with at least five years of experience (Figure 3.19).

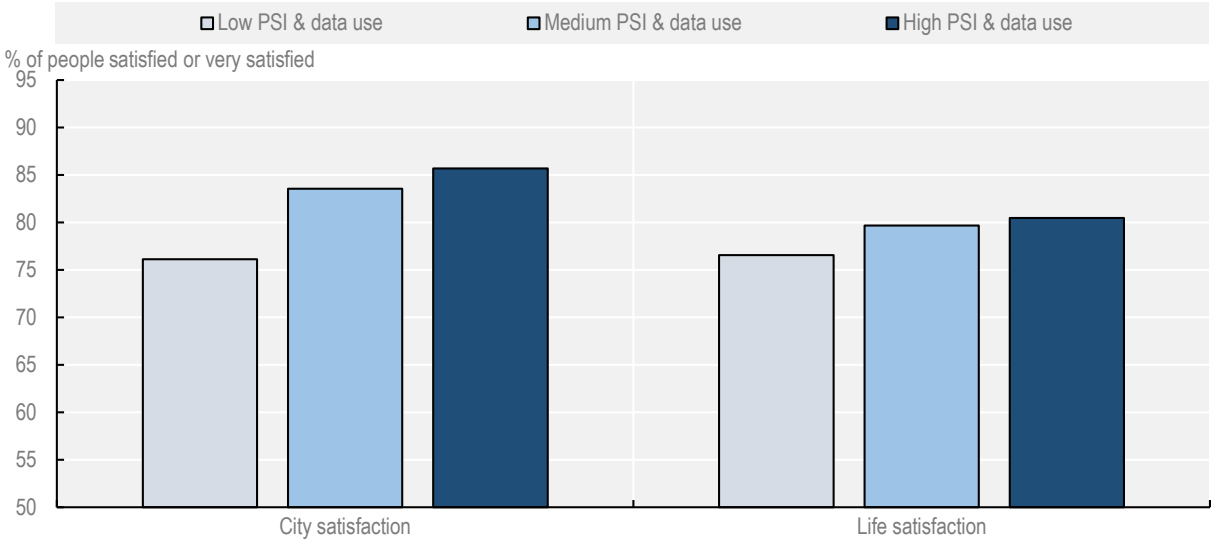
Figure 3.19. Average data use capacity by PSI practice



Sources: OECD/Bloomberg Philanthropies Survey on Innovation Capacity in Cities, 2018-20; and WWC Certification database, 2018-20.

Cities with high PSI and high data use capacity have higher city and life satisfaction than cities with lower levels of PSI and data use. Beyond the reinforcing effects that PSI and data use might have on each other, cities with high PSI and data use also display better well-being outcomes than cities with low PSI and data use. For example, in the surveyed cities, around 86% of people in cities with both high PSI and high data use report being satisfied or very satisfied with their city, almost 8 percentage points above cities with low PSI and low data use. The same pattern holds for life satisfaction, where the gap between the best and worst performers in terms of PSI and data use is around 4 percentage points (Figure 3.20).

Figure 3.20. The intersection of data use and PSI vs. city and life satisfaction



Sources: Gallup US Daily 2016-17; OECD/Bloomberg Philanthropies Survey on Innovation Capacity in Cities, 2018-20; and WWC Certification database, 2018-20.

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Annex 3.A. Data use practices by city size and income

Annex Table 3.A.1. Adoption of data use practices by city size and income

Foundational practice area	Average score within each data use foundational area, by population size (thousands)			Average score within each data use domain, by city income (relative to national average)	
	0 to 200 [75 cities]	200 to 500 [42 cities]	Above 500 [28 cities]	Below national average [69 cities]	Above national average [73 cities]
Data Governance (5)	0.61	1.21	1.93	1.01	1.07
Evaluation (5)	0.29	0.64	1.54	0.58	0.62
General Management (9)	1.97	3.31	5.54	3.41	2.58
Open Data (4)	1.37	2.38	2.82	2.03	1.90
Performance and Analytics (7)	1.52	2.38	4.21	2.58	1.97
Repurposing (4)	0.48	0.86	1.21	0.86	0.62
Results-Driven Contracting (7)	0.21	0.50	1.57	0.68	0.42
Stakeholder Engagement (4)	0.60	1.24	2.11	1.22	0.97
Average of WWC Score, from 0 to 45	**7.07**	**12.52**	**20.93**	**10.16**	**12.38**

Note: Sample of 145 cities. Number of data practices in parentheses.
Sources: WWC Certification database, 2018-20.

Annex 3.B. Regression results: Well-being outcomes and data use practices

Annex Table 3.B.1. Regression results: Selected well-being outcomes and data use practices

	% of people satisfied with their city	% of people satisfied with their life	% of people satisfied with their city	% of people satisfied with their life	% of people satisfied with their life	% of house-holds spending less than 25% of their income on rent	% of people satisfied with their city	% of house-holds spending less than 25% of their income on rent	% of people declaring no health problems	% of people with enough money to get things they need
Specification	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*
WWC score (from 0 to 38)	0.0751	**0.0815***								
	(1.00)	(1.95)								
Medium to high WWC score (10 to 38)			**3.009****	**2.442*****						
			(2.19)	(3.04)						
Stakeholder engagement (from 0 to 4)					**0.782*****	**0.651****				
					(2.86)	(2.15)				
Open data (from 0 to 4)							**1.420*****	**0.864****		
							(2.76)	(2.43)		
Performance and Analytics (from 0 to 6)									**0.272***	**0.676***
									(1.72)	(1.73)
Population (in thousands)	-0.00114	-0.000580	-0.000279	0.000150	-0.000645	-0.000985	-0.00190*	-0.00120*	0.000353	-0.00336***
	(-0.99)	(-1.04)	(-0.95)	(0.65)	(-1.23)	(-1.34)	(-1.89)	(-1.80)	(0.74)	(-3.47)
Household income deviation from national average (%)	0.151***	0.134***	0.124***	0.118***	0.134***	0.00343	0.145***	0.00282	0.0842***	0.204***
	(7.25)	(12.70)	(6.18)	(9.07)	(12.56)	(0.24)	(6.85)	(0.20)	(7.14)	(9.50)
Constant	81.42***	76.79***	81.01***	76.83***	76.88***	79.94***	79.75***	79.04***	78.05***	71.74***
	(64.51)	(125.55)	(67.63)	(132.59)	(149.55)	(107.22)	(55.38)	(76.23)	(147.87)	(49.71)
Observations	140	140	168	168	140	141	140	141	139	139

Notes: Linear regressions using ordinary least squares (OLS) estimation. Standard errors are corrected for heteroscedasticity. t statistics in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01.
Sources: American Community Survey; Gallup US Daily 2016-17; and WWC Certification database, 2018-20.

4 Leveraging innovation and data use during the COVID-19 crisis

Cities are on the frontline of responses to the COVID-19 crisis. The pandemic exposed an array of urban problems and shed light on inequality affecting people and places, especially in large urban areas. More than ever, city governments need to embrace public sector innovation, and open and digital government to overcome the crisis and rebuild better than before. This chapter explores how city governments and their innovative policy responses have played an indispensable role throughout the COVID-19 crisis, and how innovation and data use will continue to aid cities' recovery through the long term.

The value of innovation and data use in times of crisis

Today, cities are home to almost half of the world population and this share is projected to reach 55% by 2050 (OECD/European Commission, 2020[1]). When COVID-19 ravaged the globe, cities ground to a halt. Municipalities suffered a multi-dimensional crisis that upended residents' lives along health, economic and social lines. As of December 2020, the World Health Organisation reported over 65 million cases and over 1.5 million deaths related to the COVID-19 pandemic (World Health Organization, 2020[2]). The second wave of the virus may lead to a 9.5% decline in GDP among OECD countries, which would be the largest since the Great Depression (OECD, 2020[3]). Lockdowns and social distancing measures greatly reduced in-person interaction and cultural activity, vital both to residents' mental health and cities' economies.

While city residents enjoy better living conditions overall than people living elsewhere (OECD/European Commission, 2020[1]), cities also suffer the economic impacts of the pandemic most acutely. By summer 2020, Paris, France, saw its economic activity decrease by 37% from mid-March, compared to 34% at the national level (OECD, 2020[3]). Between January and September 2020, 38 600 jobs were lost in Paris, representing 40% of job loss for the Ile-de-France region. By the final trimester of 2020, unemployment in Paris increased by 8% among active jobseekers (compared to the same period in 2019). The economic impact was particularly felt among those below 25 years old, with an unemployment increase of 31.8%, almost 23 percentage points more than the national increase (L'Atelier parisien d'urbanisme, 2021[4]). Such unemployment waves can lead to disruptions in the housing market, adversely impact physical health, increase stress and preclude consumer spending that fuels the service, entertainment, fashion and tourism industries, among others.

Unfortunately, urban residents can struggle more than the average to access relief from local governments due to severe drops in cities' fiscal revenue. New York City, NY, United States, anticipates a loss of USD 7.4 billion in tax revenue over the next two fiscal years, while Los Angeles, CA, United States, might lose up to USD 829 million over the same period (OECD, 2020[3]). Florence, Italy, estimates it will lose one-quarter of its EUR 800 million budget due to the decimation of its tourism industry, which represents 15% of the city's GPD (Gautheret, 2020[5]). These losses come at the same time that local governments face large increases in expenditures, mostly due to purchasing protective equipment for workers, implementing lockdown measures and providing emergency support for the most vulnerable. The dual effects of higher expenditures and lower tax revenue threatens the quality of service delivery and safety nets for residents (OECD, 2020[3]).

As with most crises, the COVID-19 pandemic exposed inequality between people and places; the threats are disproportionately felt by the most vulnerable population in large cities, including women, children, the elderly, the disabled, the homeless, low-income households and immigrants. These groups are more likely to suffer from loss of income, decreased access to public services, employment and housing insecurity, isolation associated with social distancing, and increased exposure to the virus.

These challenges, each one difficult enough by itself, converge to present an unprecedented moment for local governments, their staff and their residents. Cities must deliver more and better services to more people at a faster pace under tighter deadlines and tightening budgets in a life-or-death situation. Such a daunting scenario calls for bold ideas to overhaul cities' methods of governance nearly overnight. This chapter explores how innovation and data use serve as crucial tools, supporting cities in the short-term management of the pandemic while moving towards a smarter, greener, more sustainable, inclusive, long-term recovery.

Leveraging innovation and data use to combat crises

Under normal circumstances, local governments recognise the potential of innovation and data use to tackle community challenges and improve residents' well-being under "increasing citizen expectations, decreasing government budgets, and changing demographics" (What Works Cities, 2015[6]). According to responses to the 2018-2020 OECD/Bloomberg Philanthropies Survey, cities leverage public sector innovation to improve their performance most in three areas: public service delivery, internal government operations, and anticipation and management of future challenges (Figure 2.1). Faced with the COVID-19 crisis, local governments resorted to measures that were politically and socially unimaginable just a few months before. Cities both served as vehicles helping national governments implement mitigation measures and pioneered a series of bottom-up innovative responses.

Drawing examples from more than 100 cities worldwide, a stock-taking and analysis of OECD policy responses to COVID-19 (OECD, 2020[3]) shows that local governments swiftly adopted innovative measures to render city operations more efficient and public services more accessible (Box 4.1). In a matter of weeks, local governments "put together testing and contact tracing programmes, built food-delivery services, assembled housing assistance programmes, [and] converted streets for outdoor dining and social distance recreation", among other innovations (Bloomberg.org, 2020[7]).

Local governments worldwide accelerated the adoption and implementation of public sector innovation and data use to guarantee the same or increased levels of internal operations and public service delivery. Fortaleza, Brazil, is convinced that innovation plays a key role in ensuring the provision of services to the population and in fighting COVID-19. In London, United Kingdom, the first emergency response shifted 95% of public service employees to working remotely while ensuring the uninterrupted operation of 500–800 types of public services (OECD, 2020[8])

On top of maintaining service delivery, local governments found innovative ways to tackle practical challenges posed by COVID-19, such as social distancing and lockdowns. Curitiba, Brazil, implemented several solutions, including the creation of online stores for local artisans and entrepreneurs, establishing partnerships with start-ups to offer a virtual marketplace with payments and delivery, deploying artificial intelligence (AI) for the timely identification of COVID-19 symptoms and offering digital consultation to medical patients. Likewise, the municipality of Lisbon, Portugal, launched an open innovation programme, Smart Open Lisboa TOMORROW, to respond to crowdsourced solutions and tackle organisational challenges in the context of the pandemic.

Box 4.1. Cities innovate policy in response to the COVID-19 pandemic

As part of the global effort against the COVID-19 pandemic, the OECD Centre for Entrepreneurship, SMEs, Regions and Cities (CFE), in collaboration with the OECD Working Party for Urban Policy and the OECD Champion Mayors Initiative for Inclusive Growth, developed a note on cities' policy responses. This note provides analysis on issues related to the economic, social and environmental impacts of COVID-19, lessons learned around digitalisation, mobility, density, urban design and collaborative governance, and action-oriented guidance to rebuild cities better.

Short- and medium-term responses provided by cities cluster around six categories: social distancing; workplace and commuting; vulnerable groups; local service delivery; support to business; and communication, awareness-raising and digital tools. The policy note draws ten lessons from the crisis to rebuild cities better.

1. COVID-19 had asymmetrical impacts across territories, but many policy responses were place-blind and uniform, highlighting the need for place-based and people-centred approaches.
2. The health crisis turned into a major economic and social shock, and cities' exposure and recovery depend on industrial composition, labour market breakdown and trade openness.
3. The rediscovery of proximity provides a catalyst to shift from increasing mobility toward enhancing accessibility by revisiting public space, urban design and planning.
4. The crisis exposed inequality between people and places, especially in large cities, where vulnerable groups such as migrants, the poor, women and the elderly were hit hardest.
5. The health problem is less related to urban density than to structural inequalities and the quality of urbanisation – the "urban premium" will likely not turn into an "urban penalty" because the benefits of agglomeration continue to prevail.
6. Digitalisation, a game changer during the crisis, will remain a key to a "new normal", although teleworking ability varies both across and within countries.
7. The "Zoom effect" and "Greta effect" accelerated environmental awareness, making the transition toward clean mobility and circular economy more politically and socially acceptable.
8. COVID-19 bears implications for governance, with citizens' trust in governments increasing in some countries – especially for local politicians – and decreasing in others.
9. The COVID-19 shock calls for a stronger focus on resilience: preparedness for future shocks requires managing "Who" does "What" at "Which scale" and "How" for more resilient cities.
10. Global agendas such as the SDGs, the New Urban Agenda and the Sendai Framework are both timely and relevant to reshape planning, policy, strategy and budget from the ground up.

Source: OECD (2020[3]), "Cities policy responses", *OECD Policy Responses to Coronavirus (COVID-19)*, OECD Publishing, Paris, https://doi.org/10.1787/fd1053ff-en..

While innovation and data use might not involve digitally enabled tools and technologies, digitalisation is a constant and crosscutting theme across each of these initiatives. Many cities have leveraged public sector innovation and data use to accelerate a digital transformation that was already underway (Bloomberg.org, 2020[7]). The OECD Observatory for Public Sector Innovation (OPSI) remarked that governments at all levels "have compressed years' worth of technological advancements into a few weeks and months" (OECD et al., 2020[9]). These efforts centre on shifting toward virtual government operations and services, crafting digitally enabled communication with the public, and enabling digital innovation via "dedicated teams, guidance, resources and partnerships" (OECD et al., 2020[9]). According to the OECD/Bloomberg Philanthropies Survey on Innovation Capacity 2020, cities such as Leipzig, Germany, and Stockholm,

Sweden, consider digitalisation and digital solutions as areas that would benefit, either short- or long-term, from investment in innovation. London, United Kingdom, already saw democratic functions moved online, with local committee meetings taking place live via internet with questions and answers in real time. In many cases, these shifts to digitalisation were progressing extremely slowly pre-pandemic, but COVID-19 forced cities to leap forward at a rapid pace.

Box 4.2. Digital innovation and "smart" cities for greater inclusion, sustainability and resilience

Digitalisation took centre stage in recent months to help cities navigate the COVID-19 pandemic. Since the early stage of the outbreak, digital technologies made it possible to relay real-time life-saving information, keep essential public services running (such as healthcare by telemedicine) and bridge social isolation. With countries grappling with repeated lockdowns at different scales, and physical distancing requirements reshaping urban environments, many cities are expanding, accelerating and mainstreaming the use of "smart" city tools. In the longer term, the capacity to leverage the benefits of digital innovation for all will be critical to help cities rebound from the crisis and accelerate the transition to a new urban paradigm for a more sustainable and resilient future.

The concept of smart cities, for instance, changed significantly since the original (and narrow) definition combining ICT, digital usages and citizen participation, to navigating a complex system of governance involving local administrations, public agencies, firms, citizens and communities. While digital innovation remains central to the smart city concept, a key question is whether investment in smart technologies and digital innovations ultimately contributes to improving the well-being of citizens. Therefore, the OECD defines smart cities as "cities that leverage digitalisation and engage stakeholders to improve people's well-being and build more inclusive, sustainable and resilient societies".

This definition underlines that digitalisation and digital innovation are not an end but rather aim to improve people's lives for greater inclusion, sustainability and resilience. Seizing the opportunities offered by the digital transition – including those coming from artificial intelligence, cloud computing and Big Data – smart cities can improve the lives of urban residents by enhancing people's safety, increasing energy efficiency in housing, facilitating access to goods and services, boosting participatory policy making, and more.

Source: OECD (2019[10]), *Smart Cities and Inclusive Growth*, OECD, Paris, https://www.oecd.org/cfe/cities/OECD_Policy_Paper_Smart_Cities_and_Inclusive_Growth.pdf.

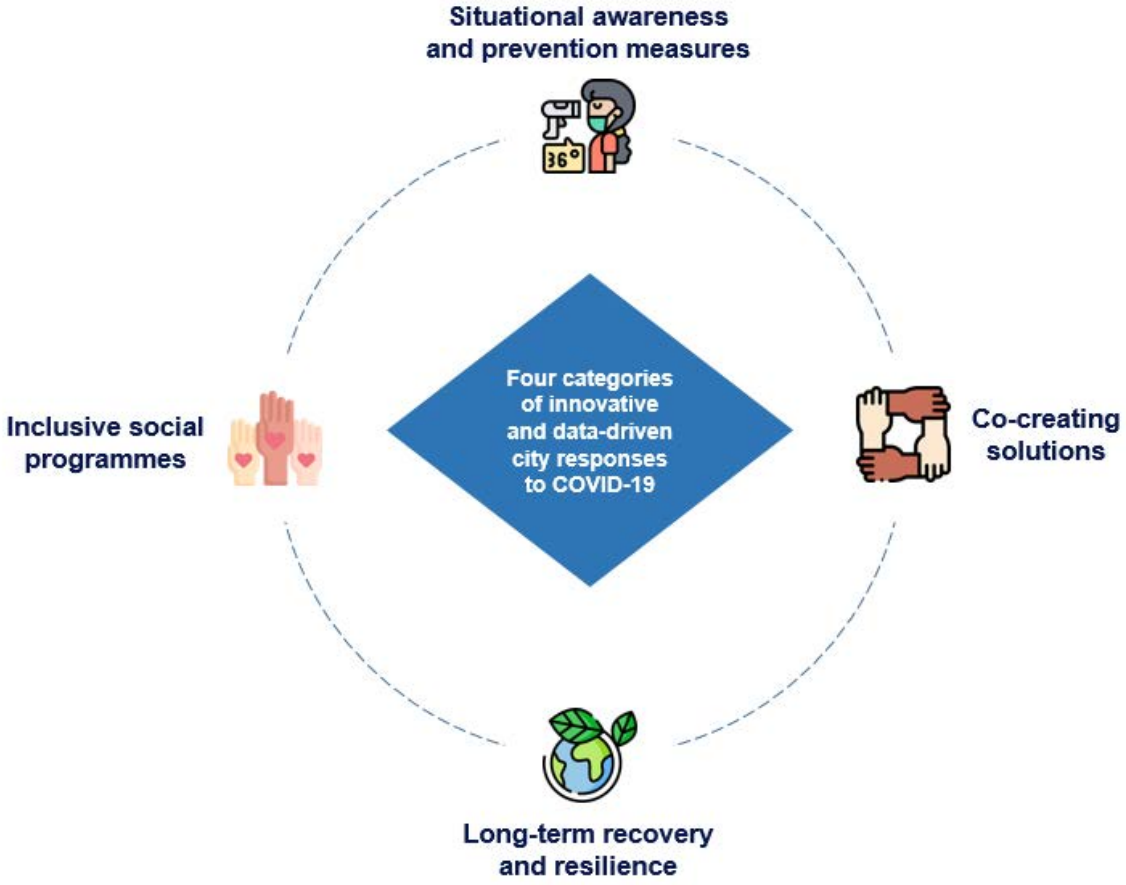
Recognising the role of innovation in response to the pandemic, many local governments committed support and funding for innovation and data use to react to and rebound from the crisis. Before the COVID-19 crisis, almost all cities responding to the OECD/Bloomberg Philanthropies Survey indicated that their municipalities had been planning to either increase (65%) or maintain (24%) future budgets for innovation. After the pandemic hit, the 70 cities that had responded to the 2020 survey version were asked if they intended to increase, decrease, or maintain their innovation budgets in light of rapid changes to priorities. Of the 18 cities that responded, 16 reaffirmed their intention to increase or at least maintain their budget plans for innovation. While this number may not be representative, it serves as an indication that many cities, albeit struggling in the midst of the crisis, are still committed to their investment in innovation.

Several cities' responses emphasised the role innovation played in COVID-19 management and recovery. While Bristol, United Kingdom, public sector managers proclaim their commitment to secure external funding and internal investment for their innovation work, Winnipeg, Canada, seeks to fund their planned increase in innovation activity by phasing in budget contributions from returns on investment generated by their innovation projects. Due to continuing restrictions regarding public safety, Dublin, Ireland, considers the need to upgrade and improve services through innovation more critical now than ever. The city found

greater demand and increased urgency for the provision of digital services, placing importance on data to support and drive these services. Dublin noted that innovation is not exclusively about technology, but also "a new way of doing things". The shift to remote working, the need to maintain public services under tight restrictions and the impact on the well-being of city staff and residents only intensified Dublin's need to innovate around daily operations and service delivery.

The sections below outline how cities leverage data-driven and innovative solutions to the crisis in four broad categorisations: (1) situational awareness and prevention measures (e.g. dashboards, apps), (2) inclusive social programmes (e.g. targeting vulnerable groups), (3) co-creating solutions (e.g. hackathons, partnerships) and (4) long-term recovery and resilience. These categories often overlap. For instance, in Estonia, a government-hosted hackathon led to the installation of SUVE, an AI chatbot, on public websites to improve communication with residents (OECD et al., 2020[9]). In this case, a co-creation event led to providing residents with increased situational awareness to help prevent the spread of COVID-19.

Figure 4.1. Four categories of innovative and data-driven city responses to COVID-19



Source: Author's elaboration.

Situational awareness and prevention

Cities are no strangers to leveraging data-driven innovation to inform, protect and empower residents. From the OECD/Bloomberg Philanthropies Survey, 60% of cities report earmarking innovation funding to invest in digital infrastructure. Indeed, the impact of data-driven innovation was most visible during the immediate outbreak of the crisis, when local governments applied digital tools in several areas to slow the

transmission of COVID-19. Reflecting the urgency of the crisis, cities deployed these tools at a remarkable speed in the form of smartphone apps, online data dashboards, real- or near-time heat maps, updates to open data portals, chat bots and direct engagement with city leadership. This blitz of digital communication from cities kept residents informed of risks and best practices related to COVID-19 despite social distancing restrictions, doing well to mitigate any isolation or information vacuum.

Data-driven tools to keep residents safe

The municipal government of Paris, France, uses a digital application, COVIDOM, to help doctors monitor the health conditions of confirmed or suspected patients quarantined at home. The application, introduced and deployed as part of a national initiative, is crucial to relieving the burden on health centres and better regulating patient flows (AP-HP, 2020[11]). Likewise, the city of Vienna, Austria, developed the "COVID-19 Case and Contact Tracing Tool of the City of Vienna". This tool is used to inform and isolate persons in time, as well as to analyse data generated and to identify if, for example, a major outbreak has occurred in a facility. The data shows how the pandemic is spreading. Starting with one case, the contact tracers and the health department of the City of Vienna can analyse the data to detect how the virus has spread and how many links are associated with it. Each case is also geocoded and reflected on a map, helping to easily identify local clusters. A chatbot was installed, allowing contact tracing staff to answer common questions immediately. (DigitalCity.Vienna, 2020[12])

Municipal governments also engage in efforts to increase resident access to crucial near- and real-time information. Data-driven innovative solutions in the form of near-time dashboards and neighbourhood-level heat maps with local COVID-19 statistics can keep residents informed, convince them to stay at home, or help them decide if and when to take public transport or go grocery shopping. Increasing situational awareness in this way can keep residents aware of what constitutes risky behaviour and deter them from engaging in activities that could accelerate virus transmission. In Cincinnati, OH, United States, City Manager Patrick Duhaney tapped Chief Performance Officer Nicollette Staton and the Office of Performance and Data Analytics (OPDA) to develop tools and processes that help municipal staff and the public navigate the crisis. The OPDA successfully launched dashboards tailored to internal and external stakeholders, allowing residents to be informed of impacted municipal services or daily cases, and help the city's Emergency Operations Centre and Fire Department monitor emergency medical service responses to suspected cases (What Works Cities, 2020[13]). While these innovative and data-driven solutions were rolled out within weeks, they were the fruits of years of investment in strengthening innovation and data use capacity.

Cincinnati is not the only city in the United States stepping up to the task. As the public health crisis progressed, Mayor Eric Garcetti promptly laid out the city's response priorities, focusing on families, small businesses, healthcare workers and homeless people. Mayor Garcetti tasked his Chief Information Officer and the innovation team to collect, analyse and leverage data to inform and justify the city's key responses (Davis, 2020[14]; City of Los Angeles, 2021[15]). Measures in Los Angeles, CA, United States, built on an "existing culture of leveraging data to set goals, make decisions, and communicate with the public", proven effective in accelerating the city's responses to COVID-19 (What Works Cities, 2020[13]). Like examples of cities in the United States, Buenos Aires, Argentina, established a digital platform that provides residents information and recommendations to reduce the risk of contagion (City of Buenos Aires, 2020[16]). In order to avoid congestion and in-person contact during the pandemic, the municipal government of Fukuoka, Japan, displays mobility data (e.g. peak travel time) and provides information about online services (Fukuoka Prefectural Government, 2020[17]). The city also encourages flexible working hours both in the city government and in private companies. Open data portals and chatbots facilitate direct communication between cities and residents.

Like public dashboards, open data portals are used to maximise communication by local governments to residents and the private sector, enhancing local governments' ability to manage the crisis. Tokyo, Japan, created a one-stop COVID-19 database updated in real-time, including the number of infected people, their status, age and gender; the number of inquiries to the city's call centre; and the number of people using the subway. The website also opened its source code so that other municipalities and institutions could replicate similar websites (Tokyo Metropolitan Government, 2020[18]).

As discussed, the implications of open data deployment extend beyond keeping residents informed or crowdsourcing solutions to manage the pandemic. Open data portals are used to ensure the transparency and accountability of government measures. Even before the COVID-19 pandemic, more than 70% of surveyed cities proactively shared data, documents, and information about contracts, procurement, and/or vendor performance to increase bid competitiveness and ensure accountability. The imperative to instil this best practice became more crucial when local governments had to quickly yet strategically dispense public resources for crisis management.

One notable example is Transparencia COVID-19, deployed by the municipal government of Mexico City, Mexico. The dedicated open data portal publishes and explains the use of public resources in response to the pandemic, including vendor contracts awarded to deal with the crisis. Transparencia also shows real-time information at the borough level (alcaldía) on the number of COVID-19 cases, deaths, and hospitals with available capacity. The website also contains data curated based on three areas:

- **Public health:** Data on the patterns of the pandemic, and prevention and treatment measures adopted by the government
- **Social actions:** Data on various government programmes aimed at relieving the social and economic burden related to the pandemic, and guides on how to access them
- **Public spending:** Data and explanations on public spending in response to the pandemic, including contracts awarded to manage the pandemic, social programmes and actions of the local government, and economic support to businesses and individuals (City of Mexico, 2020[19]).

Apart from dashboards and open data portals, AI chatbots help with COVID-19 diagnoses, disseminating hygiene tips and sharing practical information on how to conduct necessary activity while respecting social distancing. Buenos Aires, Argentina, created a chatbot that provides a preliminary diagnostic of COVID-19 symptoms and automatically refers suspected cases to the operators of the Emergency Medical Care System (City of Buenos Aires, 2020[20]). Dusseldorf, Germany, established a 24/7 hotline with a phone bot to answer questions and provide them with updates on COVID-19 (City of Düsseldorf, 2020[21]).

Digital engagement by city leadership

While data-driven and digitally enabled innovations can serve as communication tools, they cannot replace direct and earnest engagement by city leaders. Leadership by the mayor consistently ranks as the most critical factor driving cities' innovation culture and activity: 84% of surveyed cities consider it 'Very important", while the remaining 16% consider it "Important" (Figure 2.5). The urgent needs provoked by the crisis emboldened city leadership to accelerate innovation and data use at an unprecedented pace.

Local governments are ramping up their data collection efforts to improve situational awareness and enhance their ability to protect residents. According to OECD (2020[9]), "the need for governments around the world to make decisions based on good evidence and data has been amplified by the COVID-19 crisis," as bad data can cost lives. Within days of the first lockdown, the government of London, United Kingdom, leveraged data to identify newly vulnerable groups. These efforts allowed city offices to set up vulnerability hubs across all 33 boroughs, co-ordinate volunteers, and provide food, medicine and necessities (OECD, 2020[8]). Dallas, TX, United States, uses data from two surveys to build a picture of residents' needs and deploy resources quickly and efficiently. Dallas's Symptom Tracker Survey collects data from residents in the form of reported symptoms and location, allowing the city to anticipate where healthcare resources

should be focused. The city's Food Access Survey does the same thing to identify areas of the city where people are struggling to find food (Edwards, 2020[22]).

City leadership also prioritises finding ways to engage and inform residents about the changing situation. Daily communication from mayors and city leaders played a key role in fostering transparency and inspiring confidence in the government's ability to manage the crisis. During the peak period, the Governor of the Tokyo Metropolitan Government in Japan, Yuriko Koike broadcast almost daily live to updates on the city's situation (Tokyo Metropolitan Government, 2020[23]). Meanwhile, the former Mayor of Dusseldorf in Germany, Thomas Geisel hosted a weekly talk show with guest speakers to discuss the local impact of the pandemic and answer questions from citizens on how Düsseldorf had been fighting the COVID-19 crisis (EUROCITIES, 2020[24]). Mayor Marvin Rees of Bristol, United Kingdom, kept residents up to date through a variety of communications platforms including newsletters, local media, Facebook Live, the council website, and the Mayor's Blog. During social distancing, Bristol's council meetings that require democratic input were streamed online, allowing residents to participate remotely and submit questions (Bristol City Council, 2020[25]). Soon after the outbreak in the United States, Mayor Garcetti of Los Angeles, CA, held daily updates to inform residents about the latest situation and measures in the city such as pausing parking rules enforcement and opening more temporary shelter beds (Office of Los Angeles Mayor Eric Garcetti, 2020[26]).

The COVID-19 crisis jolted cities forward in their capacity to provide residents with useful information, collect data to improve service delivery, and communicate quickly and effectively over digital mediums. Such innovations aimed to enhancing cities' situational awareness, help track the virus, identify residents' gravest needs and perform rapid response. While the development of these capacities proved effective in mitigating the crisis short-term, they could benefit cities in their long-term recovery efforts.

However, city officials must ensure the continuation and institutionalisation of these innovations, and not allow them to be cut once cities transition from crisis to recovery. Budget and resource constraints could threaten the long-term nature of such programmes. It is important that cities solicit feedback from residents and make data-driven decisions about what COVID-19-era innovations help them govern and support citizens most effectively.

Inclusive social programmes to support the most vulnerable

As with many crises, COVID-19 impacted the most vulnerable populations and minorities disproportionately (OECD, 2020[3]). Studies show that an individual's risk may be significantly higher if they belong to one or more vulnerable groups such as migrants, the homeless, the elderly, children or women. The multidimensional risks related to the COVID-19 crisis extend beyond health implications and loss of income to broader psychological effects resulting from social distancing and long-term confinement.

Many cities are on the frontline of crisis management to protect these groups, with emphasis on combatting structural inequalities and mitigating its immediate effects on vulnerable communities (OECD, 2020[3]). City governments are in the unique position to respond effectively to the crisis thanks to their intimate understanding of local conditions and concerns. Nevertheless, as mentioned in the previous chapter, the tremendous potential for cities to manage future risks and tackle pressing community challenges can only be unlocked with effective use of data. While the volume and variety of data generated make cities an ideal environment for data-driven innovation, data availability across key policy sectors remains unbalanced.

According to the OECD/Bloomberg Philanthropies Survey, only 55% of cities possess available data on housing and homelessness (Figure 3.2). Even fewer cities possess sufficient data for other key areas such as social welfare and social services (42%) or education (42%). This dearth of data in key sectors could prevent local governments from implementing targeted interventions in a timely and effective manner.

The pandemic changed the perceptions of city leaders and spurred programmes in domains such as housing and homelessness, domestic violence, access to education, and necessities including technology,

public services and facilities. However, local governments have not sought to re-invent the wheel with these actions. These programmes are characterised as "innovative" because they effectively extended, adopted or pivoted existing government measures to the new context of COVID-19. While these initiatives occur regardless of whether cities exploit data to inform innovation in response to COVID-19, data use could enhance cities' responses to the crisis, allowing them to plan and prevent in addition to react.

Housing and homelessness

The COVID-19 crisis highlighted the link between homelessness, the lack of affordable housing and the increased risks of infection in deprived communities. In the wake of the pandemic, cities took a series of responses to mitigate short-term impacts.

During the lockdown, Bristol, United Kingdom, worked closely with local hotels to set up a clean and secure environment for homeless people and those without access to public funds. The city also secured two temporary van sites to allow people who live in their vehicles to practise social distancing and access health and sanitation facilities (Bristol City Council, 2020[25]). By April 2020, Paris, France, partnered with the Ile-de-France regional government, Parisian Public Hospitals (AP-HP), ACCOR hotel group and other actors to launch the COVISAN project to quarantine suspected and confirmed patients who did not require hospitalisation. Hotel rooms were converted to quarantine facilities with priority access given to residents from working-class neighbourhoods disproportionately impacted by the virus (AP-HP, 2020[27]).

Lima, Peru, opened Casa de la Mujer (Women's Home) shelters for female victims of domestic violence during the lockdown period. In opening the second shelter in June 2020, the Mayor of Lima stressed that, apart from protection and necessities, affected women and minors would receive psychological, legal and social counselling, and workshops on empowerment and stress management. (Agencia Peruana de Noticias ANDINA, 2020[28]).

Besides these immediate solutions to secure safe and sanitary living conditions for those hardest hit by the crisis, cities also ramped up their long-term efforts to address the housing crisis. For instance, in response to mass unemployment from COVID-19, San Antonio, TX, United States, bolstered an existing housing assistance programme with USD 76 million, staffing pulled from dormant city agencies and by moving the paper application process online (Bloomberg.org, 2020[29]). Whereas the programme previously received 50 applications a week, it received about 20 000 in the first several weeks of the pandemic. Low-income residents in the programme are also eligible to have two months' rent and utilities paid for, and USD 300 in cash to help with vital expenses. Yokohama, Japan, increased housing subsidies for residents whose livelihoods were severely affected during the pandemic (City of Yokohama, 2020[30]).

Volunteer efforts

Local governments are at the forefront of volunteer and solidarity efforts, coming up with ideas to connect and co-ordinate the community response. Efforts to co-ordinate volunteers can help cities augment their emergency response, including in service of vulnerable populations, especially when staff and resources are stretched thin.

Through their platforms, cities such as Ghent (Belgium), Bristol (United Kingdom), and Paris and Toulouse (France) matched volunteers with requests for support from organisations and healthcare institutions during the COVID-19 crisis. From March to August 2020, Ghent bundled and co-ordinated all requests under the heading "Ghent Helpt", which received applications from a record 450 candidate volunteers (City of Ghent, 2020[31]). Likewise, the citywide volunteering platform Can-Do Bristol connected volunteers with 23 community and volunteer organisations to help respond to more than 3 000 requests for support (Can Do Bristol, 2020[32]). In less than a week, the "Fabrique de la Solidarité" received help from 1 000 Parisians in social patrolling, preparing and distributing food to the homeless (City of Paris, 2020[33]).

In the city of Chicago, IL, United States, a Racial Equity Rapid Response Team was created by Mayor Lori Lightfoot to mitigate the disproportionate impact the virus had on communities of colour (Bloomberg.org, 2020[34]). Targeting the specific needs of this population, the team distributed more than 8 000 boxes of food, 300 000 bottles of hand sanitizer, and 1 million face masks (Bloomberg.org, 2020[29]). Such socially oriented programmes can both hamper inequalities from increasing and serve as a blueprint for addressing socio-economic issues in the future.

Education and youth engagement

When it comes to ensuring the continuity of educational programmes and activities for children, digitalisation is crucial to facilitate the transition and possibly long-lasting transformation. Lima, Peru, created a virtual platform, Aprende con Lima Educación, offering educational materials for city residents (City of Lima, 2020[35]). Through La Escuela de Lima (Lima's School), the city launched an educational space where both adults and children can access free, quality digital educational content such as virtual conferences and workshops (City of Lima, 2020[36]). Buenos Aires, Argentina, implemented a school help desk called the Connected Educational Community through which parents can connect, present ideas, make inquiries and see the learning materials to accompany their children in the process. The help desk is accessible through a toll-free telephone number or online chat (City of Buenos Aires, 2020[37]).

Beyond the scope of formal education, cities work to ensure access to a range of social and leisure activities crucial to the development of youth and children. Founded by the City of Ljubljana, Slovenia, in 2009, the Young Dragons public institute provides development programmes that enable young people to enjoy quality leisure time. Since the pandemic, Young Dragons launched a digital youth centre, DigiMC, where young people, volunteers, students and youth workers of the Young Dragons can participate in virtual activities according to their interests (OECD, 2020[3]). Through the #gazteklubaetxean programme, the Bilbao City Council in Spain offers young people a chance to enjoy online leisure activities from home. People aged 12 to 17 can participate in a series of recreational and educational challenges aimed at instilling values and promoting a healthy lifestyle (City of Bilbao, 2020[38]).

Co-creating solutions

Co-creation, both through resident engagement and partnerships with outside organisations, presents an opportunity for city governments to foster bottom-up recovery. In general, involving residents in the creation process can ensure that innovations serve user needs and reduce the risk of failure (Arundel and Es-Sadki, 2019[39]), and soliciting resident feedback can provide a more accurate reflection of resident priorities in cities' budget and policy decisions (Goldsmith and Kleiman, 2017[40]). Likewise, organisational partnerships can allow cities to "enhance approaches and tools, share risk, and harness available information and resources for innovation" (OECD, 2015[41]).

The value of such partnerships is greater in moments of crisis, when residents' needs are urgent, public resources are strained and non-public-sector organisations are more willing to lend assistance. Even before the crisis, cities reported engaging in strategic partnerships for innovation with other levels of government (86%), NGOs, the academic and philanthropic sector (83%), the private sector (77%) and city residents (80%) (Partnerships section, Chapter 2).

Only 13% of participating cites reported that partnerships to enhance data capacity play no major role (Partnerships can help cities fill in gaps around data capacity section, Chapter 2). Such partnerships enable local governments to compensate for resource- or skill-related shortcomings that might impede innovation and data use. The diversity of high-skilled labour, creative minds, advanced industry and academic institutions that exists in cities allows them to act "as laboratories for bottom-up and innovative recovery strategies" (OECD, 2020[3]).

During the COVID-19 crisis, these partnerships proved to be a creative and useful method for co-creating innovative solutions across domains. Governments at all levels are "recognising that they do not have all the answers," leading many to empower residents and businesses to contribute ideas and solutions through mediums such as hackathons, issue calls to action for start-ups and fast-track useful products such as personal protective equipment (PPE) (OECD et al., 2020[9]).

Through these and other forms of co-operation, local governments are "seeking bottom-up insights and stories in order to better understand the challenges and needs of their people" (OECD et al., 2020[9]). At both the national and local level, competitions, challenges and hackathons are jointly organised by the government, civil society and private sector.

Hackathons and crowdsourcing

Bogota, Colombia, organised a #MOVID19 Hackathon (COVID Mobility Works, 2020[42]) by partnering with DataSketch, NUMO and other supporting public and private institutions. The competition relied on mobility data from open local and national sources and supporting organisations to improve the quality of transport in Bogota and reduce the risks of COVID-19 infection. Participants developed mobility solutions that adhere to the principles of sustainable transport and can be executed by the government. Their effectiveness must also be easily monitored and evaluated by the authority. One of the proposed solutions was to provide healthcare professionals with bicycles.

Tallinn, Estonia, encouraged its start-up community to take part in a national hackathon called Hack the Crisis to generate solutions to the pandemic fallout (City of Tallinn, 2020[43]). The hackathon produced tools such as MASC, a "digital solution for monitoring PPE stock and demand in hospitals," now used in hospitals across the country (OECD et al., 2020[9]). Valmiera, Latvia, organised the Valmiera Tourism Innovation Hackathon to crowdsource ideas for attracting tourists back to the city with the opening of the Baltic borders (City of Valmiera, 2020[44]). Other cities, such as Antwerp (Belgium), Cologne (Germany) and Madrid (Spain) also called for start-ups to find innovative ways to overcome COVID-19 related challenges (OECD, 2020[3]).

Such approaches empower cities to crowdsource solutions from their residents and businesses while ensuring that community concerns are embedded in their responses. Cities can also leverage innovation hubs and living labs, both important pieces of innovation infrastructure, to stay in touch with residents and solicit bottom-up solutions to local challenges related to COVID-19.

Partnerships

Besides bottom-up solutions, many city governments view the pandemic as an opportunity to strengthen existing partnerships and accelerate new ones. For instance, Mexico City, Mexico, entered a partnership with private companies like Google Maps and Waze to monitor mobility trends during the crisis. Proposed to users on a voluntary basis, the application will gather data to help contact tracing (Saliba, 2020[45]).

In New York City, NY, United States, the NYC Recovery Data Partnership is a collaboration between city government, community non-profits and private organisations to support COVID-19 response and recovery (City of New York, 2020[46]). Partner organisations share their data free-of-charge on how the pandemic affects the city, services, industries and the daily life of New Yorkers. Data partners must ensure that their data is responsibly collected, standardised, frequently updated and applicable to the city's analysis of COVID-19 efforts (e.g. allowing comparable analysis of the situation pre-COVID-19). The initiative currently counts 13 data partners. Examples of current partners and the types of data being shared include:

- LinkedIn: LinkedIn Hiring Rate, a real-time measure of hiring activity (extracted from site activity).
- Metropolitan Museum of Art: statistics on museum attendance and membership activities.

- Upsolve: Demographic information about New Yorkers signing up for personal bankruptcy services and their reasons filing for bankruptcy.
- Urban Systems Lab: Survey results about access to parks and open space during the pandemic.

This data is accessible to all city agencies upon request, pending review from the Partnership staff to ensure that their intended use complies with the principles of privacy, equity, fairness, transparency and accountability. The initiative is co-chaired by the Mayor's Office of Policy and Planning, the Mayor's Office of Data Analytics, and the Mayor's Office of Operations, with counsel from the City's Chief Privacy Officer.

Long-term recovery and resilience

The COVID-19 crisis is likely to leave its mark on cities long after the virus is under control. Things will not go back to normal as "the pandemic and its aftermath are prompting cities to rethink how they deliver services, how they plan their space and how they can resume economic growth" (OECD, 2020[3]). Thus, while many innovative responses undertaken by cities tend to be short-term measures aimed at mitigating the effects of lockdown, local governments are also putting in place long-term strategies to aid the recovery and rebuild better than before.

Strategic recovery plans

Cities can turn COVID-19 into an opportunity to design a recovery plan that is inclusive, smart, green and innovative, leading to a more equitable and liveable city post-pandemic. While the pandemic is devastating in many ways, it also prompts cities to overhaul antiquated systems and strategies. In many cases, this trial-by-fire forced them to throw out old playbooks and take courageous decisions on issues long ignored, such as climate change, inequality, homelessness, pollution, public and sustainable transport, food security, digital services and e-government, and more.

Several cities adopted wide-ranging strategies for long-term recovery and resilience. Milan, Italy, developed an Adaptation Strategy that tackles challenges through both short- and long-term actions. The proposal promotes flexibility among the workforce by encouraging smart/remote work and staggered work hours to minimise rush hour traffic. It also aims to improve and diversify mobility options using real-time traffic data to adjust car use rules, expanding cycling infrastructure, encouraging the use of shared vehicles and reclaiming public and green space for residents. Milan's strategy also aims to support social innovation and start-ups to integrate business and social objectives, while creating community cohesion. It plans to leverage existing digital services and develop new tools to ensure the expansion and accessibility of a range of public services. Immediate actions include integrating data sources to enhance analytics and implement targeted interventions, and creating the Citizens' App where residents can access public services through smartphones (City of Milan, 2020[47]).

Other cities created special offices and task forces, like Toronto's (Canada) Office of Recovery and Rebuild designed to develop its long-term recovery strategy. The city proactively engages residents, businesses and communities to gather inputs from a range of stakeholders to guide its actions around rebuilding (City of Toronto, 2020[48]). San Francisco, CA, United States, created a COVID-19 Economic Recovery Task Force to develop its long-term strategy, organised around four topics: jobs and business support (namely for SMEs); vulnerable populations; economic development; and arts, culture, hospitality and entertainment. In formulating its final recommendations, Task Force members reached out to thousands of residents through surveys, interviews, focus groups and town hall meetings (The Office of Resilience and Capital Planning of San Francisco, 2020[49]). In response to the pandemic, Bogota, Colombia, modified its Development Plan to create green jobs, maintain its employment rate and support SMEs, with particular focus on women entrepreneurship and employability (City of Bogota, 2020[50]).

Green recovery: Re-imagining public space

A radical reimagining of public space during COVID-19 serves several functions including adding bike lanes and expanding sidewalks to facilitate socially distanced transport and permitting restaurants to stay open via outdoor seating. While these emergency changes helped keep the economy alive and provided residents with a safe way to get out of the house, they also have longer-term implications.

By reclaiming urban space occupied by cars for bike lanes, sidewalks and outdoor seating, pollution levels dropped while cycling increased. Fewer cars and less traffic mean more bicycle and pedestrian safety, helping make cities more liveable. Milan, Italy, was among the first cities to "reallocate street space from cars to walking and bikes, giving 35 km of roads to pedestrians and cyclists to keep air pollution down and provide more space" to allow for social distancing (OECD, 2020[3]; Laker, 2020[51]). Paris, France, did the same for 50 km of roads. While the change is temporary, Mayor Anne Hidalgo is considering making some of these changes permanent to reduce levels of car usage and pollution (OECD, 2020[3])

Cities around the world are reclaiming street space for outdoor dining to help businesses survive the pandemic and keep workers employed. This means fast tracking or overhauling permitting processes, including in cities dominated by private cars such as Lima (Peru), New York, NY (United States), and Toronto (Canada) (Lindeman, 2020[52]). New York quickly moved to "formalise outdoor dining, launching its Open Restaurants and Open Streets programmes" early in the pandemic (Lindeman, 2020[52]). More than 9 000 businesses registered for Open Restaurants during summer 2020 – such a success that the Mayor agreed to extend the programme to 2021. Besides offering a lifeline to local business and protecting jobs during the pandemic, reclaiming street space can diminish car use. In Toronto, lane and parking spot closures are seen as "big wins in a city that allocates an incredible amount of space to cars, even with mounting pedestrian and cyclist deaths" (Lindeman, 2020[52]).

Medellin, Colombia, took the opportunity for green recovery even further, accelerating efforts to build an eco-city. With a focus on transport, Medellin's COVID-19 recovery plan aims to cut carbon emissions by 20% by 2030. The city plans to offer 50 000 electric bikes for rent at low cost, expand bike lanes by 50% in three years and electrify public transport by 2030 (Anastasia, 2020[53]). In May 2020, Madrid, Spain, piloted a car park for shared vehicles, located next to a metro station to promote sustainable intermodal transport in the central business district. Madrid is also increasing its bus lanes by 30% (OECD, 2020[3]).

Smart recovery: Leveraging digitalisation to fight the pandemic

Smart recovery and digitalisation play "a pivotal role in cities' emergency responses to the pandemic," with cities "solidifying and expanding the use of smart city tools to facilitate and make new rhythms and habits permanent" in the face of social distancing (OECD, 2020[3]). Cities accelerated digitalisation efforts that were not priorities before the pandemic but became indispensable to public services, educational and cultural material, and general connectivity necessary to survive lockdowns. Cities like Riga (Latvia), Bamberg (Germany), Istanbul (Turkey) and Tirana (Albania) developed digital learning platforms for children (EUROCITIES, 2020[54]). Tirana broadcasts classes on national television, while Riga designates one day a week as a remote workday.

Tokyo, Japan, seized the opportunity to digitalise public services including online learning, telemedicine, telecommuting and others (OECD, 2020[3]). Florence, Italy, committed to full digitalisation of municipal services, aiming to go from 85% of digitalised citizen services to 100%. This includes digitalisation of building and landscaping practices, which aims to simplify the authorisation process. Florence is also mapping the provision and quality of fibre optic connections across the city to identify areas with poor connection and ensure universal access to the internet for teleworking (City of Florence, 2020[55]).

Inclusive recovery: Targeted investments to protect the vulnerable

Inclusive recovery entails investment in several sectors, perhaps most notably housing, construction and innovation. Mexico City, Mexico, plans to invest USD 1 billion in the construction sector to create a million new jobs and public infrastructure and social housing (SinEmbargo MX, 2020[56]; Infobae, 2020[57]). Other cities use cash infusions to house the homeless to protect this vulnerable population from increased exposure to COVID-19. In Houston, TX, United States, the city worked with community partners focused on homeless services to move 2 700 people into secure housing and prevent another 2 000 struggling with rent from becoming homeless in the midst of the pandemic (Bloomberg.org, 2020[29]). Rotterdam, Netherlands, invested EUR 20 million in upgrading homeless services, including offering counselling and improved living conditions. This came after the addition of 150 homeless shelters that had been adapted to social distancing requirements (OECD, 2020[3]). Meanwhile, Paris, France, launched a EUR 6 million investment package for small and independent businesses, artisans, cultural enterprises and innovative start-ups, and EUR 4 million for members "of the social and solidarity-based economy" (City of Paris, 2020[58]; City of Paris, 2020[59]). Though each of these investments was made to provide a short-term solution to the crisis, they also provide a roadmap for a new approach to persistent problems that can be scaled up and made permanent.

Innovation and data capacity beyond COVID-19

Cities were always laboratories of creativity and innovation, and their responses to the COVID-19 crisis demonstrate that this remains the case. The unfortunate yet unavoidable demands related to the crisis propelled cities to innovate more in the past few months than they did in years. COVID-19 provided city governments with the impetus to "take bold, courageous decisions that can be politically costly but are more socially acceptable than they were a few months ago." (OECD, 2020[3])

Most importantly, the pandemic showed city governments to be agile and adaptive. A range of measures demonstrate the ability of cities to embrace technology-enabled and data-driven solutions, overhaul traditional working modes and facilitate collaboration across silos. From uncomplicated ad-hoc measures such as pop-up bike lanes and extension of outdoor seating in restaurants, to more sophisticated acts such as digitalising administrative services, cities showed they can think on their feet and leverage innovative ideas to respond to sudden crises.

Cities' responses to COVID-19 show that not every innovative measure requires a formal plan. Many measures were speedily conceived and deployed without an institutional framework or formal strategy. The crisis brought out the survival instinct in many cities, and demonstrated that innovation does not have to be resource-intensive or scrupulously planned.

However, while encouraging, cities' short-term stopgaps and advances should not be construed as substitutes for longer-term, structured approaches to innovation and data use. Though many emergency innovations are effective, there is a risk that this innovation capacity will atrophy as the pandemic abates and cities exit crisis mode. In the post-crisis era, cities might not be able to sustain and disseminate the culture of innovation, or leverage the skills acquired during the crisis. By systematically enhancing their innovation and data use capacity, cities can increase the chances that successful innovations forged in response to COVID-19 can be sustainably funded, staffed and incorporated into the bigger picture of government work rather and scaled up for impact. The infrastructure formed through innovation capacity can ensure that cities' breakthroughs in the COVID-19 era do not disappear once the virus does.

In fact, innovations achieved under the pressure of COVID-19 despite the lack of formal innovation strategy speak to the importance of institutionalising formal mechanisms such as long-term strategy and vision, dedicated funding and staff, data use and evaluation of innovation outcomes. With a solid foundation for a resilient and inclusive city where residents' well-being is at the centre of policy making, governments with

strong public sector innovation capacity might also be better positioned to anticipate future challenges, minimise imminent risks and avoid shocks from crises. They are less likely to be caught off-guard, forced to scramble to maintain levels of internal operations and public service delivery for residents. Instead, by bolstering innovation and data use capacity now, cities can be ready when the next crisis comes, putting themselves in a position to protect the most vulnerable groups of society without being thrown from their longer-term plans. In short, cities can use innovation and data use capacity to act, rather than react.

No matter the context, cities worldwide should strive to maintain the momentum built around innovation and data use during the pandemic. Without the foundation of robust capacity in both areas, successful programmes such as those launched in response to COVID-19 might not be maintained or scaled up. For instance, while cities may have re-routed staff and funding toward innovative activities at the height of the crisis, without dedicated staff or funding for innovation, both resources might be returned to their pre-COVID-19 applications. Exacerbating this risk is that abstract changes such as innovation and data use require long-term investment, and results are not immediate.

However, with a focus on building innovation and data use capacity now, cities can increase the likelihood that spontaneous leaps in deployment that occur during the next crisis may be sustained and scaled, ultimately benefiting residents.

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5 Building innovation and data use capacity in city government

This chapter provides policy guidance to city governments at all stages of their innovation and data use journeys, building on best practice examples and survey analysis from over 140 cities. Recommendations cover how to take stock of current efforts, establish and deploy strategies, and improve implementation of innovation and data use programmes. They aim to help cities clarify priorities and identify the resources necessary to enhance their innovation capacity and data use to improve residents' well-being.

Cities can leverage the COVID-19 crisis to sustain innovation growth

The COVID-19 crisis shifted the relationship between local governments and their residents. It is evident how deeply city residents rely on local government for efficient service delivery, communication and agile policy making. At the same time, cities showed that, when put under pressure, they can make significant changes in a short time—including greater incorporation of innovation and data use into government work.

What began as a health crisis became an economic and social crisis, inducing a full-scale societal transformation over a short period. Cities are no strangers to crisis management and have longstanding experience dealing with severe climate hazards, cyber-attacks, disinvestment by national governments and population influxes, which challenge their capacity to ensure residents' well-being. However, COVID-19 magnified such challenges and prompted city leaders to act on all fronts simultaneously due to the concomitant nature of many challenges. Work, school and democratic processes were rapidly digitalised. The structure of traditional working hours was called into question. Use of cars, bicycles and public transport were totally reimagined. Cities took a direct role in food and medical distribution. Almost overnight, public space was reallocated for bike lanes, outdoor dining and pop-up clinics.

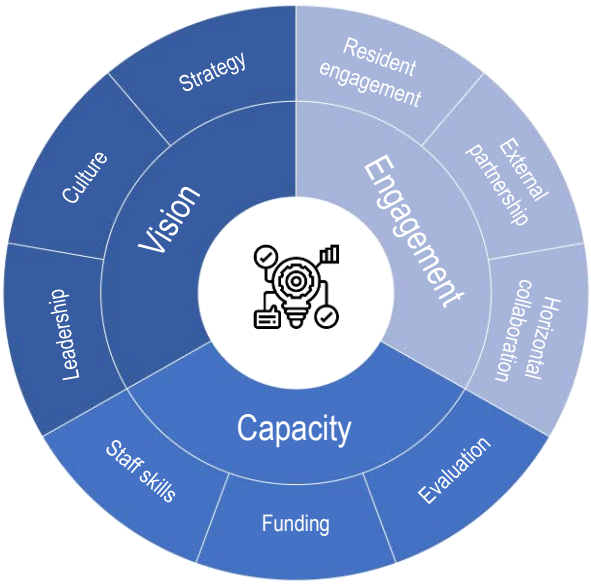
The urgency of the pandemic required data use, innovation and decision making in general to happen in real time, with instant impacts on policies, procedures and people. Public sector innovation and data use can support cities in their efforts to improve residents' well-being. The evidence in Chapter 2 of this report demonstrates a strong correlation between public sector innovation capacity and several areas of well-being, including safety, accessibility, environmental quality, and city and life satisfaction. Meanwhile, Chapter 3 documents strong links between data use and education, health, affordability of housing, and city and life satisfaction. Often, innovation and data use can be deployed in concert – e.g. using data analytics to monitor and measure the outcomes of innovation policies and programmes. This approach allows local governments that cultivate public sector innovation and data use capacity together to benefit most from these tools.

These findings are not just significant for cities in normal times; they may be especially significant for times of crisis and long-term recovery. A majority of surveyed cities report that public sector innovation helps them improve service delivery and internal operations, while roughly half claim innovation helps them anticipate future challenges. Cities also report having sufficient data in at least 16 distinct policy sectors – a goldmine of potential insights that, with the capacity for collection, analysis and maintenance, can be used to improve current policy and plan for future crises.

Innovation and data use can do more than help cities cut costs or publish data dashboards. Robust capacity and deployment of innovation and data use can help cities deliver higher quality public services, target those most in need, incorporate resident feedback and make residents active partners in service delivery. Data use can help cities identify areas of low-performance, measure outcomes compared to goals and adjust programmes accordingly, and plan for future crisis scenarios so that plans are in place before a crisis hits. The potential of innovation and data use mean they should not be viewed as peripheral projects but deployed to help cities achieve their core missions. Nor should innovation and data only be utilised in moments of crisis, but developed consistently as part of cities' efforts to govern effectively and improve residents' well-being.

It is imperative that cities transition from a general understanding of correlations between innovation, data use and residents' well-being to identifying where they are in the process of deploying these tools for that purpose and making evidence-based decisions on how to bolster their efforts to do so.

Figure 5.1. Common elements of innovative and data-driven local government



Source: Authors' elaboration.

Ten recommendations for building innovation and data use capacity in cities

The recommendations contribute to this transition based on a combination of desk research, a granular analysis of 147 cities' responses to the 2018 and 2020 OECD/Bloomberg surveys on innovation capacity, and a quantitative analysis of correlations between the data use practices of 145 cities engaged in the What Works Cities Programme and their outcomes for residents.

While touching on different domains, the recommendations for both innovation and data use capacity below are grounded in three common elements: Vision, Capacity and Engagement (see Figure 5.1). "Vision" is considered an indispensable building block in boosting cities' capacity throughout this report. Mayors, city leaders, and innovation and data stewards (i.e. CIOs, CDOs and similar functions) feed and lead such vision. Their leadership establishes and disseminates an enabling culture for experimentation, calculated risk-taking and evidence-based decision making, and implements strategy to allow such vision to come to fruition. At the same time, cities should focus on improving their technical "Capacity" by dedicating funding to strategic programmes related to innovation and data use, investing in staff skills and institutionalising evaluation and monitoring. Lastly, cities cannot effectively boost their innovation and data use capacity without "Engagement" of residents, external partners, other levels of governments and most importantly their own municipal staff. With these elements in place, cities can enhance their capacity to leverage innovation and data use to improve well-being outcomes for residents.

The 2018 and 2020 OECD/Bloomberg Surveys identified five components of public sector innovation capacity in cities analysed in this report: (1) innovation strategy, (2) innovation staff and a conducive organisational structure, (3) funding for innovation, (4) data use for innovation and (5) innovation outcomes evaluation. While Chapter 2 of this report addresses each component of innovation individually, the five are interdependent – and a strong culture of innovation across an administration (or across an entire city, including among residents) can ensure that the components develop in tandem. Cross-cutting factors to innovation, such as leadership and culture, do not fit neatly into any single component but can positively impact all five, and are included in the recommendations as well.

1. *Make innovation a top priority*

As discussed in Chapter 2, surveyed cities associate innovation most with the terms “experimentation” and “human-centred design”, while 100% of surveyed cities consider mayoral leadership central to local innovation. Combined, these observations convey the mandate for a dual approach to innovation that originates both from city leadership and from residents and city staff. Research consistently identifies administrative leadership, risk-taking and experimentation among staff, and robust resident involvement as primary factors in executing public sector innovation (Lewis, Ricard and Klijn, 2018[1]) (Demircioglu and Audretsch, 2017[2]) (Arundel and Es-Sadki, 2019[3]).

Concerning innovation driven by leadership, the message is clear: for cities to dedicate sufficient attention and resources to innovation and reap its benefits, innovation must be a priority for the mayor and agency-level management. Cities led by mayors curious about innovation but hesitant to prioritise it through allocation of staff, funding and other resources might struggle to foster a transformational innovation culture that impacts residents’ lives. Cities in this situation can struggle to spread an innovative mindset throughout the administration and find imaginative, experimental thinking and activity quarantined to an isolated innovation staff with little influence over or interaction with staff of other agencies or residents at large. Even cities with innovative mayors might see efforts stall if agency-level managers do not embrace innovation or encourage calculated risk-taking.

Cities can foster strong, culture-shifting *top-down* innovation leadership by:

- Elevating innovation from a stand-alone practice to achieve core mayoral goals.
- Moving beyond rhetoric to prioritise funding and resources (e.g. staff) for innovation activity:
  - Funding must be consistent, but not exorbitant – the more reliable the funding, the more likely an innovation can be built durably for maximum impact on residents’ well-being.
  - In-house vs. cleaning house – hiring specialised experts is not the only solution to innovation staffing; existing staff have institutional knowledge and can be trained in innovation skills.
- Ensuring, through hiring process and training, that agency heads and managers are comfortable with innovative thinking, experimentation, and risk taking.
- Injecting an innovation component into staff and agency review processes.
- Establishing and elevating an administrative position to champion public sector innovation and ensuring this position is integrated into the broader work of the city.

While there seems to be consensus among cities and in the research that leadership is vital to innovation activity, sourcing innovation from staff and residents is essential too. Such an approach to public sector innovation can mean direct, robust co-creation with residents or empowering existing city staff with institutional knowledge and place-based experience to experiment. Research demonstrates that increased resident engagement in the innovation process leads to better outcomes, while roughly 75% of surveyed cities’ staff are interested in co-creative methods such as innovation labs and human-centred design. Therefore, cities cannot allow innovation originating from residents and staff to be cast aside in favour of innovation spearheaded solely by city leadership. While the latter can provide a cogent vision with a clear set of goals, the former is necessary to channel imaginative solutions grounded in the experience of residents and staff through the tool of innovation.

Cities can promote inclusive, experimental *bottom-up* innovation by:

- Investing in and prioritising co-creation approaches with citizens, including human-centred design, innovation labs, participatory budgeting and soliciting resident input through community surveys.
- Embedding innovation training and/or competency both in hiring practices for all new staff (not just innovation staff) and in the performance review process for current staff.

- Reimagining and reforming how rank-and-file staff are incentivised (or disincentivised) to take risks, experiment and collaborate, especially across agencies
- Ensuring that the administration's high-level approach to innovation is infused into the everyday work of every agency and activity of city government, rather than narrowly focused on any single sector, outcome or methodology

Approaches to innovation originating with staff and/or residents can provide a safeguard against wasteful spending driven by motives other than improving well-being (Vera and Salge, 2012[4]).

2. Nurture a culture of innovation throughout the city, so it becomes second nature

Developing and investing in a culture of innovation is crucial to advancing all the innovation components together in an organic way. Investing in innovation skills beyond the core innovation team, and promoting experimentation and calculated risk-taking can ensure that all public employees work innovatively. Such efforts to build a culture of innovation can break down departmental silos, promote inter-agency collaboration and reduce friction around programme implementation.

Conversely, in a weak innovation culture, the same administrative separations that undermine innovation can isolate innovation components from each other. For instance, a strong innovation team is vital to broader innovation activity, but innovation culture is limited to that team, their overall impact on the city will be curtailed (Goldsmith and Kleiman, 2017[5]).

Innovation culture is not limited to the administration. Resident engagement throughout the conceptualisation, development, pilot and implementation process of innovation activity can lead to higher-quality, longer-lasting and more effective innovations (Arundel and Es-Sadki, 2019[3]). This is especially true when the goal of innovation is to improve outcomes for residents: cities that treat residents as partners in the creation process (rather than simply end-users and recipients) can establish feedback loops between residents and local government that generate a virtuous cycle.

Cities can build a culture of innovation by:

- Hiring staff with a background in human-centred design.
- Deploying tools such as data analytics, hack-a-thons, innovation labs, participatory budgeting, resident surveys and co-creation to foster a culture of innovation among residents and city staff.
- Applying human-centred design to engage stakeholders in co-creating new programs, services and policies through in-person and digital interactions (e.g. during COVID-19).
- Identifying weaknesses in innovation capacity and establishing partnerships that can double as training and allow city staff to gain skills and knowledge.
- Integrating innovation training for all staff, with a focus on empowering them to innovate in their current roles; embed innovation into hiring practices relevant to demonstrated needs.
- Investing in management and leadership with prior experience in innovation and human-centred design across the administration, not just for Chief Innovation Officer positions.
- Encouraging and incentivising calculated risk-taking, spearheaded by innovation leadership.
- "Silo-busting" and inter-agency collaboration (e.g. data or document sharing); incorporating cross-agency performance reviews centred on cross-cutting themes (e.g. pollution) rather than sectors.
- Enshrining these concepts and priorities in the city's formal innovation strategy wherever possible.
- Engaging stakeholders for co-creation with an eye toward in-person interactions between stakeholders post-COVID-19 (and interactive digital options in the interim).
- Gleaning feedback on innovation activity from residents through tools such as surveys and apps, and requiring that insights be incorporated into budget and policy decisions.

3. *Create a formal, publicly shared innovation strategy with measurable goals*

Cities must define what innovation means in their local context, adopt a formalised strategy and set concrete, outcome-oriented goals that can be evaluated throughout the innovation process. Residents of cities with a formal innovation strategy report higher satisfaction with their city than residents of cities without one (see Chapter 2), suggesting a formal innovation strategy may be the linchpin for building capacity in each of the five components. For example, to identify staffing needs, select datasets for analysis, earmark funds and settle on performance benchmarks for measurement, a city must first formalise its goals and priorities through adoption of a formal strategy. While cities' applying innovation to specific policy sectors can help cities target specific challenges, a holistic approach to public sector innovation is among the principal drivers of correlation between innovation capacity and city satisfaction. In addition, while public administrations (and/or residents) might be resistant to wholesale implementation of innovation strategies, city agency staff and residents could be more receptive to sweeping changes if they are included in the design process.

Cities can adopt/update their innovation strategy to produce better resident outcomes by:

- Ensuring that the strategy includes goals that are measurable, concrete and translate to better outcomes for residents (e.g. "improved resident health", not "improved efficiency").
- Prioritising a holistic approach to innovation that cuts across all sectors, rather than a strictly sector-based approach (while allowing sector-specific work to flourish within a holistic framework).
- Clarifying the role of existing staff in strategy implementation (e.g. trainings, required number of hours dedicated to innovation work, etc.), preferred skills and backgrounds for new hires, and/or how innovative approaches will be assessed in performance reviews.
- Including realistic, concrete expectations and needs concerning funding and data use.
- Identifying resistance to strategy implementation (e.g. administrative inertia, lack of staff familiarity, sceptical residents), and including steps to address these challenges.

4. *Invest in dedicated innovation staff that reports to senior leadership*

City satisfaction is significantly higher among residents in cities with a robust innovation staff, and a strong correlation exists between the time cities' innovation teams have been in place and the percentage of cities evaluating innovation outcomes and/or strategy. Cities can use hiring practices and professional development to equip administrative employees with the innovation skills and experience to improve residents' well-being through innovation. However, innovation teams "depend on strong relationships with city agencies", and can only deliver new approaches to governance if they "first get information and buy-in from the people who will be implementing the plans" (Goldsmith and Kleiman, 2017[5]). If innovation staff remain "outsiders" detached from or dismissive of core local government, they may "almost never have an impact" on budgets, internal operations or residents (Goldsmith and Kleiman, 2017[5]).

Cities can ensure innovation staff have an impact on residents' well-being by:

- Clarifying priority skills (e.g. basic data analysis, experimental thinking) and backgrounds for future hires relative to stated goals, not just for innovation teams, but all staff members, where possible.
- Incorporating innovation skills and thinking into ongoing training and/or performance evaluation of employees, relative to stated goals.
- Ensuring that innovation staff is embedded into the administrative context through joint agency meetings and reviews, short-term staff swaps, collaborative projects, etc.
- Creating feedback loops for lower-level staff (e.g. using surveys and trainings, so that they are empowered to innovate in their positions while applying their institutional knowledge).

- Providing innovation staff funding and resources to stabilise and sustain workflows, understanding that results (e.g. evaluation-based evidence) might take time to emerge.

5. Build stable, long-term innovation funding into the city's budget

Innovation funding plays a significant role in the development of all other components – but that does not mean cities need exorbitant standalone innovation budgets, or that cities with strained budgets must forfeit their innovation aspirations. Instead, it means that cities must be realistic about what they can accomplish with their budget, creative in tapping partnerships and other resources (e.g. staff on loan, capstone projects with local universities) and consistent in their innovation funding despite mayoral or staff turnover. As Chapter 2 shows, cities appear to be re-allocating their innovation budgets from a focus on strategy and staffing to data work and impact evaluation. This shift is likely reflective of cities' innovation activity maturing over time, from establishing fundamental needs to capturing evidence and measuring outcomes concerning the value of investments.

Cities can ensure that innovation receives stable funding regardless of budget size by:

- Setting a dedicated budget for innovation *ex ante*, enshrined in the city's formal innovation strategy and incorporated into budget discussions, rather than waiting to see "what's left over".
- Spending smarter: prioritise low-cost or self-sustaining innovations over "shiny new toys" (beware of expensive/complex technologies billed as innovative, or for innovation "bridges to nowhere").
- Extending innovation funding requirements beyond leadership turnover, so projects sustain funding throughout development, implementation, results and evaluation of innovation activity.
- Engaging Chief Innovation Officers (where they exist) or other champions in budget hearings.
- Investing in, producing and leveraging evidence on innovation impact through outcomes evaluation, data analytics, qualitative surveys and tracking savings generated by innovation to substantiate decisions about resource allocation and advocate for future funding.
- Leveraging strategic partnerships to fill funding gaps and grow long-term capacity: in lieu of direct funding, cities can partner with local organisations to provide skills or resources (e.g. data analytics) the city cannot afford, with "knowledge sharing" between those organisations and city staff.
- Generating buy-in and champions on city councils and in the community.

6. Leverage data to make decisions and evaluate outcomes

Innovation and data use can be nebulous concepts that cities struggle to define and deploy in a way that improves residents' well-being. While "some data-driven ideas are substantive…others are bright, shiny objects" (Goldsmith and Kleiman, 2017[5]). Yet data use does have a role in monitoring and evaluating innovation activity and decision making by allowing cities to re-allocate resources, staff and funding based on evidence rather than hunches or politics. Despite these advantages, just 39% of surveyed cities report that data plays a significant role in their innovation efforts and decision making (see Chapter 2). This low level is not due to a lack of data (at least half of surveyed cities report having "sufficient data" in nine policy sectors) or a lack of staff capability (two-thirds of cities have a data scientist on staff). Instead, the problem may stem from insufficient emphasis on all aspects of data use, and a weak data-driven culture (see Chapters 2 and 3).

Cities can bolster their data use for innovation activity and decision making by:

- Prioritising basic data use training among all existing and future city staff.
- Co-ordinating city data collection and generation efforts: render various formats of data compatible upfront for better access, sharing and analysis.

- Enshrining data competency standards (beyond just open data) in the city's formal innovation strategy – open data is a first step to a widespread data use culture, but other capacities are needed.
- Engaging and expanding the community of city (open) data users through events (e.g. hack-a-thons) and trainings on how to access and use city data.
- Incorporating data methods (e.g. randomised control trials, results-driven vendor contracts, resident surveys, etc.), enabling the city to evaluate innovation activity and guide decision making.

The term "data use" refers to much more than open data. It also refers to cities' capacity for collecting data, opening and sharing data in a comprehensible way for external shareholders, combining data (e.g. ensuring compatibility), and analysing data to guide decision making (Janssen et al., 2017[6]). Only by building capacity in these and other areas of data use (explored below) can cities leverage the potential of data to improve innovation implementation and decision making in general.

Assessing the outcomes of public sector innovation eludes governments and researchers alike because it is difficult to identify a good outcome. As summarised by Mintzberg (1996[7]), "many activities are in the public sector precisely because of measurement problems: If everything was crystal clear and every benefit so easily attributable, those activities would have been in the private sector long ago." Most cities struggle to evaluate innovation outcomes systematically and comprehensively, which can undermine their ability to acquire resources such as funding. Without evidence of impact, successful projects can fail to secure funding necessary to scale up. Robust evaluation capacity can also help cities monitor and assess innovation initiatives throughout the development and implementation process, allowing them to make changes and identify new opportunities to innovate continuously.

Cities can improve both their innovation evaluation practices and residents' well-being by:

- Setting goals up-front: cities must enshrine clear, measurable goals in their innovation strategies so that innovation teams are clear on what to measure and how to do so.
- Keeping it simple: instead of investing in a long-term, complex and expensive data metrics programme, start with qualitative resident surveys or targeted, randomised control trials to generate actionable data:
  - Cities should take a full inventory of what data they already possess, both publicly and among agencies, to measure outcomes.
  - Cities must not delay evaluation efforts because they lack "sufficient" data in a certain area – use qualitative metrics, interviews, etc., but insist on a system of evaluation.
- Monitoring and evaluating an innovation project from its inception and throughout its lifespan to determine what's working, what's not, and whether to terminate before further investment.
- Having a back-end plan: beyond ensuring that outcomes are measured, cities must also specify how analytics and insights resulting from evaluation will be used, e.g.:
  - Establish channels of how insights will be conveyed between those conducting the evaluation and those responsible for implementation/maintenance of innovation activity.
  - Ensure clear communication of innovation results (good and bad) with the public and other funding sources in the name of accountability and good government.

As discussed in Chapter 2, there are hints that evaluating innovation outcomes ramps up as cities' innovation teams and other components mature. However, to make all other innovation investments worth staff time and residents' tax money, cities must not wait. They should prioritise the evaluation of outcomes relative to innovation activity by any means. As mentioned, evaluating innovation outcomes to demonstrate evidence of impacts can help teams secure stable funding and scale-up projects.

7. Build and institutionalize good data governance practices

Leadership and vision are crucial elements of a good data governance strategy. At the local level, city governments should integrate fragmented strategies by institutionalising data leadership and stewardship, and developing a longer-term and coherent data strategy. While data use can be adopted in the absence of any formal strategy, a flexible yet well-conceived data strategy can ensure accountability and transparency, define leadership roles, set measurable objectives and outline expectations. A coherent data strategy can also serve as a foundation for municipalities to embrace and sustain a wide range of best practices at the tactical and delivery level.

Cities can secure a strategy for data practices by:

- Recognising data as a strategic asset to be enhanced, leveraged and shared within and across city government as well as with external stakeholders.
- Setting a clear vision, aspiration and incentives for city government to pursue ambitious.
- Communicating and demonstrating to municipal staff and external partners that data-driven governance and evidence-based decision making are an institutional priority.
- Institutionalising citywide data stewardship in the forms of a dedicated data team(s) and/or leader(s) to embed, enhance and accelerate the strategic use of data.
- Expanding the structure of data stewardship to include technical, organisational and legal dimensions to ensure that city government approaches each stage of the government data value cycle in a strategic, efficient, user-friendly and compliant manner.

8. Develop and implement coherent data strategies

Cities should focus their capacity on developing and implementing coherent data strategies, policies and initiatives. This capacity can be cultivated through elements such as data skills and staff capabilities, data openness and stakeholder engagement.

Cities can improve the data skills and capabilities of municipal staff by:

- Focusing on skills for collecting, processing, storing, analysing, sharing and (re)using data.
- Identifying municipal employees whose duties involve data management and analysis, and creating a central resource to upskill these staff.
- Identifying data skills gaps in specific programmes, activities or initiatives (e.g. randomised control trials, results-driven contracting, impact measurement, performance analysis, predictive analytics) strategic to achieving the municipality's policy objectives.
- Equipping non-specialist municipal employees with basic data literacy so that they can understand how key decisions are made based on quality data, and communicate these standards to external partners and residents, if needed.
- Recognising data as the tool rather than the solution: flawed approach to data management and analytics distort insights and lead to ineffective interventions.

Cities can enhance data openness by:

- Publishing city data in user-friendly and machine-readable formats to a central, public, online location (in the absence of conflicting interests and privacy concerns).
- Rendering real- and/or near-time city data accessible for the purposes of openness, transparency and accountability of local government activities, and boosting public trust.
- Rendering real- and/or near-time city data accessible for the purposes of maximising the social and economic impact of these data (e.g. developing new services and business opportunities).

- Formulating a publicly available codified open data policy that commits to transparency and proactive public disclosure.
- Establishing mechanisms to facilitate data sharing across agencies and levels of government (where there are explicit efforts to support intra-government data sharing).

Cities can engage stakeholders by:

- Fostering a vibrant community of data users:
  - Gathering information on public data users and their uses of these data.
  - Communicating, consulting and incorporating their needs, and collaborating and involving them in the design of the city's data practices and the construction of its open data portal.
  - Providing guidance to access and utilise public data in a user-friendly and effective manner.
  - Providing for collaboration that incentivises the use of public data to solve community problems.
- Building an extensive network of trusted public and private partners:
  - Identifying needs in the city's programmes, activities or initiatives to set the level of stakeholder engagement that matches intentions and fulfils policy objectives.
  - Forming partnerships for the purpose of mutually enriching data sets, co-producing databases and pooling resources and capabilities to perform advanced analysis.
  - Leveraging competences, skills, technologies, expertise and resources of data partners to deepen the impact of data.

9. Establish well-defined, transparent regulatory frameworks for using and sharing data

Tactical approaches must also consider the legal and regulatory aspects of data, from technical and organisational standards of compliance to data-related rules and guidelines, put in place by municipalities to ensure openness, protection, transparency and accountability.

Cities can create well-defined legal and regulatory frameworks for data practices by:

- Establishing regulatory standards that define, drive and ensure compliance with data-related rules and policies, including data management, sharing and protection.
- Embedding legal mechanisms that strengthen data sharing and co-ordination, horizontally across different municipal departments, vertically with other levels of government and externally with stakeholders and partners.
- Formulating regulations that balance efforts at data sharing and integration with the security, privacy and ethical dimensions of data.
- Balancing the opportunity of linking up data for more comprehensive datasets for in-depth analysis against potential security breaches, especially for personally identifiable data or data that can easily be de-anonymised.

10. Make data strategies standard in all operational procedures

While not explicitly discussed in the OECD data governance framework for the local public sector, delivery is as important as strategic and tactical aspects because its implementation of data strategies considers the technical and policy implications of actions undertaken at various stages of the data value cycle. Local governments need to enforce and maintain high operational standards for delivery. When it comes to the day-to-day management of data, local governments should be aware of the practical implications, risks and barriers to optimal data use at each stage of the government data value cycle. By mapping the flow of city data – from unprocessed data and information to insights for decision making – city administrations will be able to navigate and unlock the full potential of their strategic assets. Improper handling of data at

any stage of the cycle can start a cascade onto subsequent stages. Delivery also touches on data infrastructure (i.e. adopting or adapting technological solutions such as application programming interfaces, cloud-based services, data lakes) and data architecture (e.g. standards, interoperability, semantics, etc.) to help public sector organisations achieve objectives defined in their strategies.

Cities can enforce high operational standards in daily data management and practices by:

- Moving away from generating (administrative) data for "single-use only" purpose: residents, agencies and private firms should only provide data once for access to public services.
- Being rigorous in the collection and generation of reliable, representative and up-to-date data sets to maximise their insights.
- Co-ordinating data collection efforts among city agencies to avoid data duplication and incompatibility.
- Appraising the quality of data: cleanse, sort, inventory and determine whether certain personally identifiable data can be linked up and/or anonymised before being stored for future use.

Cities can use data architecture and infrastructure to optimise their daily operations by:

- Acquiring and upgrading the technical infrastructure needed to facilitate data sharing, integration and management across institutions.
- Right-sizing data and technological solutions to ensure that the procurement of infrastructure fits the current needs and internal competences of the municipality.
- Securing municipal networks and digital infrastructure.

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Innovation and Data Use in Cities

A ROAD TO INCREASED WELL-BEING

The 2019 OECD/Bloomberg Philanthropies report *Enhancing Innovation Capacity in City Government* built a deeper understanding of local public sector innovation, in particular, why cities innovate, how they innovate, what is driving their innovation, and the impact on residents.

As a follow-up to this work, the OECD and Bloomberg Philanthropies launched a new project in 2020 to build evidence on the relationship between cities' innovation and data capacity and residents' well-being. This report summarises the key findings from the survey and What Works Cities performance assessment from over 200 cities, an extensive study on innovation capacity and data use in cities, and includes a novel approach to assess resident well-being at the municipal level to provide evidence and analysis on the relationship between local public sector innovation capacity and data use efforts and resident well-being outcomes.

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