A World Bank Group Flagship Report

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DIGITAL DIVIDENDS

WORLD BANK GROUP

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The World Bank

SECTORAL SPOTLIGHT: SMART CITIES
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SECTOR FOCUS 4

Smart cities

Cities are where problems and solutions meet. They are our centers of commerce and innovation—and the gateways to the global economy. With the world rapidly urbanizing, cities will only grow in importance; the urban population of the developing world is expected to double between 2000 and 2030, adding 2 billion city dwellers. This creates urgency to get our cities "right" because the global response to our most pressing challenges—from climate change to rising inequality—will likely succeed or fail in cities.

Innovative urban leaders have begun to tap into new streams of data on the state and performance of their cities, often in real time, to realize a forward-looking vision of a "smart city"—a city that leverages the latest in technology and connectivity to make better decisions and achieve the urban aspirations of its residents.[1] Specifically, smart cities collect lots of data through *instrumentation*, bring these data together through *integration*, and then analyze the integrated data for *intelligence* on how to improve the city's services and quality of life (figure F4.1). Smart cities use this three-step approach to tackle everything from reducing traffic congestion to fighting crime to improving air quality.

Despite widespread enthusiasm, however, discussions held under the World Bank's Urbanization Knowledge Partnership indicate that most city leaders struggle to understand how to best invest in intelligent infrastructure and connectivity to deliver long-term value. In addition, the concept of a smart city has grown somewhat controversial. Proponents argue that smart city innovations offer a genuine revolution in city management. Skeptics see empty hype that risks wastefully distorting the investments of resource-constrained governments as they prioritize

"fancy" technology over less exciting but more important foundational investments.
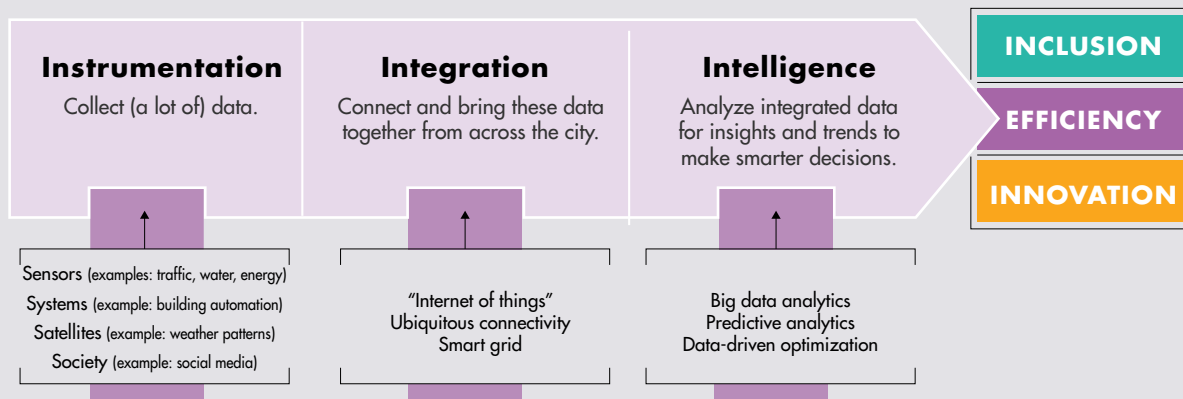
While evidence of sustained impact remains elusive, governments allocate significant sums on smart city projects, including in the developing world. China has launched a reported US$70 billion "smart city" credit line and a US$8 billion investment fund.[2] India is seeking to leverage its homegrown information technology (IT) industry to construct 100 smart cities, with a first-year budget of US$1.2 billion. [3] Rio de Janeiro implemented a first-of-a-kind Intelligent Operations Center, bringing together data from over 30 agencies and services in a command center like that of the U.S. National Aeronautics and Space Administration (NASA). Even resource-constrained cities in Africa are embarking on the smart city journey, such as in Konza Techno City near Nairobi.

Pragmatically, old and new cities alike have begun to incorporate smart technologies into the everyday fabric and complexities of their existing urban centers to drive greater efficiencies in city operations; provide a platform for innovation at a citywide scale; and promote social inclusion through heightened accountability, citizen empowerment, and smarter decision making.

Efficiency—to do "more with less"

By collecting large amounts of data and then translating these data into insights, cities are able to boost the efficiency and responsiveness of their operations. Data help cities better match the supply of public services with real-time needs and uncover emerging problems before they turn into crises. Smart city technologies make this possible in several ways. *Automated*

Figure F4.1 Smart cities: From data to intelligence

Instrumentation	Integration	Intelligence	
Collect (a lot of) data.	Connect and bring these data together from across the city.	Analyze integrated data for insights and trends to make smarter decisions.	**INCLUSION**
			EFFICIENCY
			INNOVATION

Sensors (examples: traffic, water, energy)
Systems (example: building automation)
Satellites (example: weather patterns)
Society (example: social media)

"Internet of things"
Ubiquitous connectivity
Smart grid

Big data analytics
Predictive analytics
Data-driven optimization

Source: Adapted from Palmisano 2008.

optimization translates data from cameras, sensors, and anonymized cellphone records into intelligence to, for example, help optimize traffic flows in real time. *Predictive analytics* uses such data to track and predict everything from rainfall to crime hot spots to possible landslide areas. *Evidence-based decision making and planning* can continuously monitor milestones and targets to ensure cities can quickly take corrective actions as needed to achieve their goals.

Innovation—through collaboration at city scale

Most smart city innovations have their origins in the private sector. Engineers argue that a city is essentially a complex system of systems, and each of these systems generates data that can be analyzed to make cities smarter. But for individual "smart systems" to add up to a "smart city," innovations must be on a citywide scale. That requires contributions and ideas not just from commercial firms but also from governments and citizens through public-private-people partnerships.

Open data, social media, and cellphones enable governments, firms, and citizens to exchange vast amounts of information at virtually no cost—making it far easier to share knowledge and ideas that are distributed throughout society. These tools also enable real-time collaboration, enabling governments to view their citizens and firms not just as passive customers of public services, but as key partners in innovative problem solving. Amsterdam and Singapore have begun to use this collaborative approach to bring together citizens, businesses, and government to experiment with innovations to lower their city's environmental footprint, one neighborhood at a time.

Governments can facilitate collaboration through three platforms. Through *local open data*, cities share local data with the public, promoting transparency, accountability, and collaborative problem solving. Through *"living labs,"* governments designate parts of the city as test beds to collaboratively pilot new ideas. Through *urban analytics centers*, cities partner with local universities and industry to seed cross-disciplinary research centers with systematic access to local urban data.

Inclusion—to ensure everyone benefits

City leaders should focus smart city efforts on the needs of *all* residents. Three valuable urban practices in the developing world are worth noting. First, *use data to target the most vulnerable*, as São Paulo did by developing a comprehensive geographic database of socioeconomic and physical indicators to prioritize housing and slum upgrading investments. Second, *open up data to promote accountability*, including grassroots initiatives such as the mapping of facilities, pollution, and community needs in Kibera, Nairobi's largest informal settlement. Third, *tap mobile connectivity to expand civic participation*, as cities in the Philippines have done for participatory budgeting and for crowdsourcing the identification of smoke-belching vehicles.

The road ahead—the city as a laboratory

The explosion of urban data will slowly give rise to a "science of cities." City leaders can speed up this process by turning their cities into laboratories for smart innovations that translate local experiments

into global knowledge, and global knowledge into local solutions.

This exchange of ideas will no longer flow only from the West to the rest, since rapid urbanization enables cities in the developing world to leapfrog their global peers by incorporating smart from the start in ways that are cheaper and easier than retrofitting legacy infrastructure. Cities in the "global south," from Rio to Shanghai, often push the boundaries of innovation as aggressively as their peers in the "global north." In fact, smart cities may be the first instance of a large-scale urban transformation that is truly global in origin, with innovations and ideas flowing in all directions simultaneously—and with pockets of innovation appearing in unexpected places.

Accelerating this progress will require actions at all levels. Global institutions like the World Bank can facilitate the sharing of experiences. Cities can work together to establish open standards to avoid vendor "lock-in" and to make it easier to share solutions—a community-developed app in, say, Chicago, can then be rapidly deployed in Chengdu and Caracas. Local governments can address the often fragmented structure of their bureaucracies and outdated procurement systems that are incompatible with the design and implementation of integrated IT systems. And city halls everywhere should bring together governments, firms, and the public to jointly design a vision for the future of their city with long-term goals and short-term priorities to guide the development of smart city projects that deliver value for all the city's residents.

Notes

1. Townsend 2013.
2. *People's Daily,* "China Prepares for Smart City Construction Boom," October 16, 2013, http://en.people .cn/90882/8426660.html.
3. *Times of India,* "Government to Set Up 100 Smart Cities," July 23, 2014, http://timesofindia.indiatimes .com/india/Government-to-set-up-100-smart-cities /articleshow/38919516.cms.

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Townsend, Anthony M. 2013. *Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia.* New York: W. W. Norton.