SUSTAINABLE SMART CITIES:
# IMPROVING QUALITY OF LIFE

2014

Introduction

"Smart Cities" is an emerging trend for policymakers all over the world, including Qatar. Today, the majority of the world's population lives in cities, generating about 80 percent of the global GDP. Migration and rapidly rising standards of living are contributing to an unprecedented worldwide surge in urbanization. This scale of urbanization requires efficient management of resources, infrastructure development, and the control of traffic congestion and pollution. The social and economic complexities of urbanization add to the challenges.

Therefore, understanding and applying smart city concepts—of which technology is a crucial component—is key to ensuring an attractive standard of living for residents of Qatar. This white paper, part of a series on ICT trends and emerging technologies, is designed to make both the public and the private sector aware of the challenges and opportunities of smart city approaches, as well as influence policy development and service delivery in Qatar. Smart Cities was identified as an important new concept in the Ministry of Information and Communications Technology's (ictQATAR) first white paper: *Emerging ICT Trends: The Future Is Now*. As part of its ongoing research, the Ministry convened a roundtable discussion in June 2014—"Smart and Sustainable Cities in Qatar"—and invited representatives of organizations involved in making smart cities a reality, including service providers, government agencies, the private sector, and other large organizations. These participants provided valuable insights into smart city approaches and into the specific circumstances in Qatar, and they recommended policy and program actions for ictQATAR's consideration.
The Ministry would like to thank all participants for their valuable contributions.
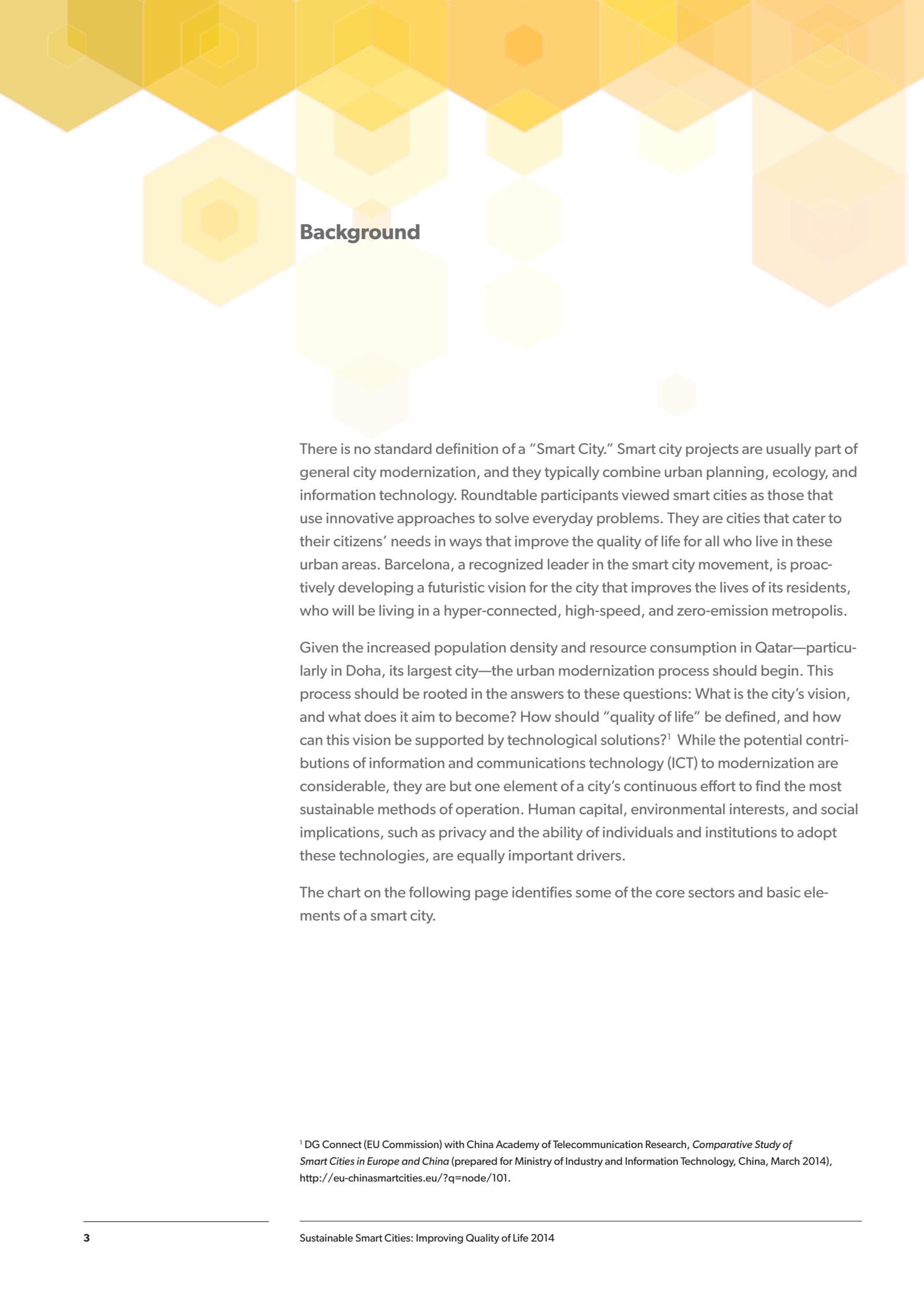
Background

There is no standard definition of a "Smart City." Smart city projects are usually part of general city modernization, and they typically combine urban planning, ecology, and information technology. Roundtable participants viewed smart cities as those that use innovative approaches to solve everyday problems. They are cities that cater to their citizens' needs in ways that improve the quality of life for all who live in these urban areas. Barcelona, a recognized leader in the smart city movement, is proactively developing a futuristic vision for the city that improves the lives of its residents, who will be living in a hyper-connected, high-speed, and zero-emission metropolis.

Given the increased population density and resource consumption in Qatar—particularly in Doha, its largest city—the urban modernization process should begin. This process should be rooted in the answers to these questions: What is the city's vision, and what does it aim to become? How should "quality of life" be defined, and how can this vision be supported by technological solutions?[1] While the potential contributions of information and communications technology (ICT) to modernization are considerable, they are but one element of a city's continuous effort to find the most sustainable methods of operation. Human capital, environmental interests, and social implications, such as privacy and the ability of individuals and institutions to adopt these technologies, are equally important drivers.

The chart on the following page identifies some of the core sectors and basic elements of a smart city.

[1] DG Connect (EU Commission) with China Academy of Telecommunication Research, *Comparative Study of Smart Cities in Europe and China* (prepared for Ministry of Industry and Information Technology, China, March 2014), http://eu-chinasmartcities.eu/?q=node/101.

Figure 1: CORE SECTORS AND BASIC ELEMENTS OF A SMART CITY

Urban Planning
Smart Buildings
Local and Global Interconnectedness
Disaster Recovery

Smart Governance
Government and Agency Administration
Smart City Office
Strategy and Policies

Energy and Environment
Water and Waste Managment
Energy Grid Systems
Water Forecast

Smart City Elements

Social and Public Services
24/7 Healthcare Services
E-learning
E-services

Security and Control
Real-Time Monitoring
Smart Incident Reporting
Data Centers

Mobility
Intelligent Transportation Systems
Smart Parking
Navigation Systems
Rail and Aviation Systems

Source: ictQATAR

Smart Qatar:
Opportunities and Benefits

Creative thinking, cooperation among stakeholders, and bright scientific ideas—"smart" solutions—can bring about the required benefits for Qatar, including the ability to accommodate the population boom efficiently, improve economic growth, and enhance the welfare of its people. Scalable solutions that take advantage of ICT are required. There is now an opportunity for Qatar to develop, integrate, and monitor its entire critical infrastructure including roads, rails, airports, communications, power, and buildings to better optimize resources and maximize services to residents, while maintaining all aspects of security.

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Roundtable participants well understood that the biggest advantage of smart cities is an overall improvement in citizens' well-being and living conditions. If the cities' problems are handled with smart approaches and solutions—with technology as an enabler (e.g., safety, transport)—social, economic, and environmental benefits will result. Participants further suggested that while developing a futuristic vision for the country, policymakers must at the same time quickly identify and address the pressing problems of the cities. For example, they pointed to the transportation sector as a priority area for Qatar. They suggested that the government require immediate and smart solutions to handle the growing traffic problems. Participants also recognized another priority: that the emerging smart cities remain safe cities too.

Smart cities development can foster new services as well as jobs. Improvement in resource allocation, usage, innovation, and entrepreneurship opportunities will benefit the overall economy. Furthermore, cities can promote their smart and sustainable credentials to enhance their locational competitive advantage and attract new businesses and talent.

At this point, Qatar's cities can be designed in an environmentally conscious manner with measures that enable waste reduction, a low carbon footprint, and the usage of renewable energy resources. A greener city will present a cleaner, healthier, and more pleasant environment for its residents.

Challenges and Strategies

The complexity of cities manifests itself across many areas of local government, including governance, policy, and the interdependence of various sectors. In addition, some sectors may not understand how each of the other sectors works within the context of city development and operations—or how different components interact with one another.[2] Therefore, stakeholders may struggle to reach consensus on methodologies for implementation of smart solutions. Roundtable participants expressed the necessity of having an overarching vision as well as a platform for collaboration among all stakeholders, where various sectors can come together to discuss problems, share ideas and information, and develop solutions collectively. This platform will enable all players and assist them in their efforts to be smarter. Collaboration is an extremely important element since smart cities cannot be built by one entity alone. International practices support the premise that that smart projects almost always require the input of multiple stakeholders. A collective command and control center is needed to enable the exchange of information; currently, each entity is operating independently, and this approach is counterproductive.

Many countries (including those in the EU) have implemented good governance mechanisms to develop public/private partnerships and citizen participation. Allowing sectors to share experiences and success stories has helped foster innovation and generate new ideas.

For these types of mechanisms to become a reality in Qatar, concerns of confidentiality and privacy need to be addressed. It is essential to have a government policy that fosters access and collaboration; otherwise it will be difficult for organizations to be transparent. Participants expressed their concern about the risk that sensitive data—such as data regarding the country's energy consumption or water usage—will be misused if it is widely available and open. However, at the same time, they realize that information from one sector can have significant influence on and value for others. Hence, the government must have efficient privacy and security-related policies and mechanisms in place to help overcome these concerns.

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[2] Gordon Falconer and Shane Mitchell, *Smart City Framework* (Cisco Internet Solutions Group, 2012), http://www.cisco.com/web/about/ac79/docs/ps/motm/Smart-City-Framework.pdf.

Another challenge discussed in the roundtable was stakeholders' differing views on what is "smart." For example, an architectural point of view may be quite different from an environmentalist's perspective. There is no agreement on the criteria for smart cities, and there is no uniformity when it comes to standards and policies. This challenge reinforces the previously mentioned need for a smart city office in Qatar that coordinates all such issues. The idea of having smart and sustainable cities needs to be harmonized during city planning. Transformation from an ordinary to a smart city entails the integration of ICT, and those that champion it must collaborate with political and governmental institutions such as city councils, national institutions, and urban planning authorities, all of which may ultimately affect the outcome of any ICT initiatives. Institutional readiness, including the absence of legal and regulatory barriers, is important for smooth implementation of smart city initiatives. Another associated challenge is interoperability between systems and entities. Good governance is essential not only to ensure the needs of entities but to also address the needs of citizens and residents. Awareness campaigns—aimed at users—that educate and encourage adoption of smarter technologies can assist with this.

The efficient utilization of data to identify and address problems was a topic discussed at the smart cities roundtable as it had been at the roundtable on big data. Qatar already has a vast amount of data on many subjects, including health care and energy. However data collection is not enough if the data is not utilized efficiently and shared. This is where Qatar falls short, according to participants. Mechanisms for data analysis and use are needed.

An interesting discussion at the roundtable centered on the fact that the initial investment in smart city solutions may cause a spike in costs that might not be welcomed by residents. However, certain participants pointed out that while smarter cities might initially lead to a short-term increase in the cost of services to residents, over the long term, smart city solutions will ultimately lead to efficient and cost-effective methods. Nevertheless, participants advised the Ministry to push the smart city agenda ahead with Qatar's government and real estate developers since investment will be required.

The roundtable participants concluded that the government must take the lead in introducing supporting policies and initiatives and coordinating efforts to ensure that the prerequisites for success—including an overarching national vision, collaboration, data sharing, and uniform standards—are in place. Stakeholders look to the govern-

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ment to initiate the strategy and collaboration, getting buy-in from all players to build a governance model that ensures commitment to a common national vision. In addition, in order to effectively use information systems to enable progress in the development of smart cities, effective policies and an appropriate legal framework must be put in place. To that end, roundtable participants recommended the establishment of a smart city office to enable the collaboration and problem solving necessary to arrive at policies that support an effective ecosystem.

Below is a snapshot of some of the main challenges and counterstrategies for Qatar:

Figure 2: SMART AND SUSTAINABLE CITIES IN QATAR

CHALLENGES	COUNTERSTRATEGIES
Need for national vision and drivers	Develop a national strategy with clear milestones, targets, and responsibilities
Inconsistent or conflicting methodologies and resistance	Develop a governance model for organization and sector alignment Develop common standards and a policy framework
Interdependencies	Identify stakeholders and create a common platform (smart city office) Facilitate communication among stakeholders Insure interoperability and compatibility of systems and applications
Skills and attitudes	Develop ICT training for employees Promote digital literacy among residents Develop awareness campaigns
Security concerns	Establish and implement policies to ensure privacy and confidentiality Support up-to-date infrastructure and systems
Costs	Ensure long-term, sustainable investment Support efficient utilization of resources

Source: ictQATAR
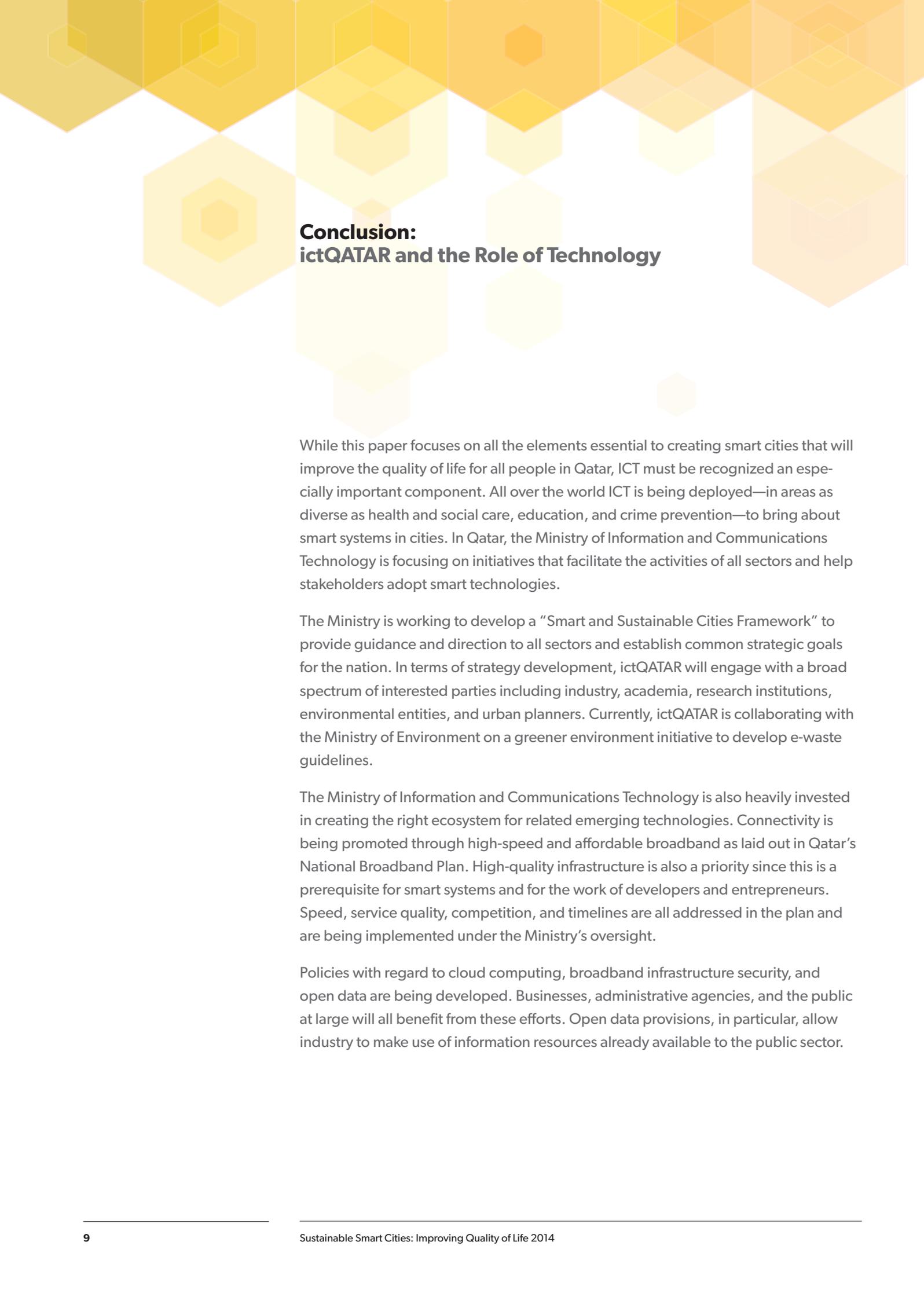
Conclusion:
ictQATAR and the Role of Technology

While this paper focuses on all the elements essential to creating smart cities that will improve the quality of life for all people in Qatar, ICT must be recognized an especially important component. All over the world ICT is being deployed—in areas as diverse as health and social care, education, and crime prevention—to bring about smart systems in cities. In Qatar, the Ministry of Information and Communications Technology is focusing on initiatives that facilitate the activities of all sectors and help stakeholders adopt smart technologies.

The Ministry is working to develop a "Smart and Sustainable Cities Framework" to provide guidance and direction to all sectors and establish common strategic goals for the nation. In terms of strategy development, ictQATAR will engage with a broad spectrum of interested parties including industry, academia, research institutions, environmental entities, and urban planners. Currently, ictQATAR is collaborating with the Ministry of Environment on a greener environment initiative to develop e-waste guidelines.

The Ministry of Information and Communications Technology is also heavily invested in creating the right ecosystem for related emerging technologies. Connectivity is being promoted through high-speed and affordable broadband as laid out in Qatar's National Broadband Plan. High-quality infrastructure is also a priority since this is a prerequisite for smart systems and for the work of developers and entrepreneurs. Speed, service quality, competition, and timelines are all addressed in the plan and are being implemented under the Ministry's oversight.

Policies with regard to cloud computing, broadband infrastructure security, and open data are being developed. Businesses, administrative agencies, and the public at large will all benefit from these efforts. Open data provisions, in particular, allow industry to make use of information resources already available to the public sector.

The Data Privacy Protection Law has been approved by Qatar's Cabinet and is now under review by the legislative committee. Once enacted, the law will address nearly all stakeholders' concerns with regard to privacy of information.

The Ministry's Digital Incubation Policy bolsters entrepreneurship in Qatar by establishing an entrepreneurial environment that supports creative efforts.

As Qatar enters the 4G network stage, smart city development and management as well as the demands of businesses and citizens with regard to bandwidth, speed, reliability, and security—in an age of ubiquitous computing and the Internet of Things—will all be supported. The recent surge in the number of e-services and the e-commerce law are also major advantages.

Figure 3: THE ROLE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY

Privacy and Confidentiality

M2M/Internet of Things

Broadband Connectivity

Data Managment and Analytics

Mobile Networks

Software Applications and Systems

Open Data

Cyber Security

Cloud Computing and Services

Smart Devices

Source: ictQATAR

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Qatar Rail

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