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# Making cities smart and sustainable

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# **Preface**

### 'Sustainability is about ecology, economy and equity.' – Ralph Bicknese

Our planet, inhabited by over 7 billion people, is in the midst of a massive transition in terms of the ecosystem, climate change, tectonic plate movements and biological evolution. Among these, climate change, largely attributable to human activities, is one of the most critical issues impacting our planet. Climate change brings with it adverse consequences such as threats to biodiversity and ecosystems, risks to human health, rising sea levels due to accelerated melting of glaciers and ice caps, increasing water stress as well as a decline in agricultural productivity. These issues are driving many worldwide economies and cities to focus on mitigating greenhouse emissions in order to combat the impact of climate change. Cities account for the majority of greenhouse gas emissions and energy consumption across the globe. As cities are economic growth drivers in most of the nations, urbanisation is projected to increase further in the near future. This, in turn, will drive the depletion of non-renewable resources as well as add to the extent of carbon dioxide emissions. To cope with rising urbanisation and climate change issues, innovation and digital technology must be leveraged to minimise energy consumption and improve quality of life. Innovation must be combined with energy, digital technology and information and communications technology to address urbanisation challenges and ensure sustainability. Sustainability covers not just the environmental aspect but also social equity and the economy. The globe is witnessing a shift in economic corridors of power, as China and India are seen as the most powerful economies to watch out for. These emerging economies too need to take pre-emptive steps so as to avoid the devastating consequences of climate change.

The Indian government has undertaken concrete steps for making smart cities a reality with the recent announcement of 98 aspirants. These smart cities will compete with each other to come up with holistic plans for becoming model cities. The government has incorporated sustainability as one of the key components of smart cities. With the increasing frequency of natural disasters, abnormal weather patterns and the looming threat of global warming, the concept of a smart city must be merged with sustainability for the welfare of people and our planet as a whole. The marriage of innovation with technology will go a long way in optimising the management of infrastructure and resources and, at the same time, focussing on inclusiveness and a greener environment. Smart sustainable cities will lay the foundations for a better future—a future where cities care for people, the earth, air, water and the environment.

This knowledge paper has been prepared for a seminar organised by the Information Exchange Group's summit 'Smart City Landscape 2015', to be held in New Delhi on 10 and 11 September 2015. The paper is intended to stimulate discussion on the possible avenues for merging the concept of sustainability with the smart city framework to improve the quality of life for city inhabitants. It will also enable decision-makers to take cognisance of the existing situation, study the best global practices and explore avenues for incorporating them into their city mission and planning.

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Smart sustainable cities

Leader, Government and Public Sector PwC India





## **Cities: Why smart and sustainable**

*Citizens: 'True,/The people* are the city.' – William Shakespeare, Coriolanus, Act 3. Scene 1

Cities are indispensable to nations they are hubs of economic growth and innovation and are cultural melting pots. They usually have unique characteristics and a cultural identity as well as present a multitude of options for business, employment, leisure, entertainment, healthcare and education. Given these attributes. cities attract people from rural regions seeking opportunities for employment, education and a better lifestyle. Hence, cities have been witnessing the megatrends of population explosion, a growing middle-class population and urbanisation. By the year 2050, approximately 70% of the global population is projected to live in cities. Moreover, Asia, Africa and other emerging economies will be home to nearly 80% of global urban population in the near. India, too, is experiencing these trends, with an exponential growth in urban population owing to the promise of more employment and entrepreneurial opportunities and good quality of life.

Urban population (% of total) Name of country : India

34

33





1. UN World Economic and Social Survey 2013

- http://www.un.org/en/development/desa/policy/wess/wess\_current/wess2013/WESS2013.pdf
- 2. http://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS
- 3. http://www.un.org/en/sustainablefuture/cities.shtml

4. UN World Economic and Social Survey 2013

As per the data from Census 2011, the population living in urban regions contributes 63% of the country's GDP. This share is only expected to increase further as more and more people migrate to urban areas. By the year 2030, cities are forecast to have 40% of the country's population and account for 75% of the country's GDP. Thus, cities are likely to continue being the powerhouses and talent warehouses Wof India.

Apart from advantages, urbanisation also brings with it certain challenges. Many Indian cities are plagued with various environmental, social and economic issues such as resource scarcity, congestion, pollution, poverty, lack of affordable housing, proliferation of informal dwelling, as well as sewerage and sanitation problems. In fact, urbanisation is placing an environmental load on natural resources as cities account for 60-80% of energy consumption across the globe and for more than 70% of worldwide carbon dioxide emissions.

In order to provide better living conditions for existing and future generations, cities need to be improved by adopting the smart route and at the same time focussing on the sustainability aspect. Currently, urban infrastructure is mostly developed without giving much consideration to sustainability. Looking at urban development through the sustainability lens paves way for the concept of sustainable cities. According to the World Bank's Sustainable Cities Framework:

as resilient cities that can more readily adapt to, mitigate, and promote economic, social, and environmental change. Sustainable development encompasses all aspects of a city's healthy development and should be done with a *triple bottom-line in* m

'Sustainable cities (SC) can be understood

#### economic/financial, social, and environmental issues.'

At the same time, ICT and its applications have played a transformational role in solving complex problems around the world. The potential to use ICT-enabled solutions for helping cities deliver innovative and improved services to citizens led to the concept of smart cities. Over the years, there have been many definitions of a smart city and each of these has had varied linkages with sustainability. But the recent conceptualisations of a smart city, including the Indian government's smart city guidelines, do accord due importance to sustainability principles. PwC's smart city concept states that:

'Smart cities leverage technology and utilise existing and planned infrastructure investments to provide a higher quality of living to residents, a conducive investment climate for businesses and allow maximisation of resource utilisation and transparency for governments. They can *be considered for organic integration* of systems, IT infrastructure, physical infrastructure, social and business infrastructure. These systems work collectively so as to generate intelligent and actionable information for decisionmakers.'

From the above two definitions, it is evident that the two concepts share a common vision. Also, ICT can play a significant role in realising the vision of a sustainable city, and any city that runs on a robust ICT-enabled infrastructure and service delivery model needs to be sustainable as well. Therefore, it is only natural to expect the convergence of these two concepts into something that leverages ICT as well as places the sustainability lens over urban development and planning. That is, a city needs to be both sustainable and smart. According to the International Telecommunication Union Telecommunication Standardization



'A smart sustainable city is an innovative city that uses information and communication technologies (ICTs) and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social and environmental aspects.'

Sustainability calls for economic also calls for inclusive stakeholder engagement, robust governance, accountability and continuous monitoring, and transparent reporting.

Successfully embedding these tenets of sustainability into smart city plans will require clear articulation of the role of ICT in achieving the city's vision, urban development benchmarks, responding to the needs of citizens and other stakeholders, and supporting the required governance structure. According to the ITU-T FG-SSC's master plan for smart sustainable cities, there can be no single approach for making a city both smart and more sustainable. Each city is unique, with a unique economic, environmental and social context, and will have to determine a unique path to becoming smart and sustainable.



### Smart city components



Physical infrastructure

- Urban mobility
- Smart communications
- Smart environment
- Smart spaces
- Smart surveillance



- Smart healthcare
  - Smart education
- Recreation: arts, sports, entertainment



parks, hubs, etc.

the field of ICTs.

#### Sustainable city components

#### **Economic progress**



- Competitive economy
- Employment growth and opportunity
- Affordable housing
- Governance

- Smart energy management
- Smart water management
- Smart waste management

- Incubators, skill development centres, specialised business

### Environmental stewardship

- Climate change mitigation and adaptation
- Water, waste and energy management
- Green buildings
- Sustainable transport
- Water quality and air quality
- Natural resource management, including biodiversity and green cover

#### Social development

- Social inclusion, stakeholder engagement and participation
- Human rights
- Sanitation, public health and safety



#### Smart sustainable cities and Sustainable Development Goals (SDGs)

The SDGs are a proposed set of global development targets to be adopted by governments around the world. There are currently 17 goals with 169 indicators that will define the global sustainable development agenda post-2015. Spearheaded by the United Nations, the SDGs are set to be approved in September 2015 at the UN Summit and are going to replace the Millennium Development Goals (MDGs). The MDGs led to unprecedented progress in certain areas but fell short of transforming societies, as they were focussed solely on poverty alleviation in the developing world. The SDGs, on the other hand, will be globally relevant and present a holistic approach to progress by embracing economic, social and environmental dimensions. As governments gear up to sign the SDGs, key roles will be carved out for multiple stakeholders, including society and businesses. The pillars of a smart sustainable city are also directly or indirectly aligned with the objectives of the SDGs. The closer the integration of sustainability into India's '100 Smart Cities' initiative, the greater will be the linkages with the SDGs.

#### How smart sustainable cities are aligned with SDGs





Make cities and human settlements inclusive, safe, resilient and sustainable

Ensure sustainable consumption and production patterns

Take urgent action to combat climate change and its impacts (taking note of agreements made by the UNFCCC forum)

Conserve and sustainably use the oceans, seas and marine resources for sustainable development

Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification and halt and reverse land degradation, and halt biodiversity loss

Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels



Smart environment

Green buildings

and adaptation

Affordable housing

Smart surveillance

Climate change mitigation

Smart energy management

Smart water management

Water, waste and energy

Smart energy management

Smart water management

Smart waste management

 Climate change mitigation and adaptation

Natural resource management,

including biodiversity and

green cover

Smart environment

management

• Natural resource management, including biodiversity and green cover



• Smart city pillars

Sustainable city pillars

## Smart sustainable city: Getting there

A smart sustainable city is a holistic city with multiple themes or components to ensure easy service delivery and quality life for citizens. With recent announcement of 98 smart city aspirants by the government, India has taken concrete steps towards the smart city transformation. As per the mission guidelines for smart cities released by Ministry of Urban Development, a clean and sustainable environment will be a significant feature for upcoming smart cities. The sustainability aspect is not just in terms of environment but also economic, social and governance. The three pillars of sustainable economic advancement, political participation and social emancipation are the core foundations of a smart sustainable city. We have listed the key themes that contribute to making smart sustainable cities.

## Engaging citizens for governance

Governance has been evolving with the passage of time, from autocracy and anarchy to democracy. Citizens are the pillars of a nation, for they choose a government and all governance policies, laws and regulations are focussed on them. However, very often, inputs and ideas are not sought from citizens, and decisions are made by few elected representatives. Those decisions may or may not reflect the pulse of the people. With the advent of the smartphone revolution, social media proliferation, a dynamic media industry and instant connectivity, people are becoming increasingly aware as well as keen to voice their opinions and do their bit for society by sharing their inputs with policy-makers. Gone are the days of closed-door policy-making and imposition of laws and regulations without any consultation with citizens. Participatory governance focusses on the democratic engagement of citizens to improve citizen participation in governmental policies as well as to crowdsource ideas. Participatory governance does away with

assumptions and solicits public opinion on upcoming policies and regulations. It also involves seeking ideas from people for the betterment of cities. Similarly, crowdsourcing gives citizens the opportunity to showcase their talents, creativity and intelligence. Participatory governance provides a platform for citizen-government interaction that bolsters the concept of democracy as well as improves service delivery and inculcates social inclusiveness. Many countries have robust platforms for citizen-government engagement for political inclusion, crowdsourcing and addressing governance problems by involving citizens in decision-making.

### Opening up data for transparency and service delivery

As defined by the Open Knowledge Foundation, data is open if it is free for use, reuse and redistribution without any legal, technological or social restrictions. Major features of data openness are access and availability, universal participation as well as redistribution and reuse. Management of data has become considerably important, particularly from the purview of governance. The data can be related to the environment, transport, weather, transport and traffic, statistics and finance. Open data helps in ensuring transparency across systems, driving the participation of citizens in governance and improving service delivery by virtue of leveraging data for the welfare of people at large. With open data, governments may fuel the set-up of groundbreaking services and businesses that render commercial and social value. Additionally, open data will facilitate coordination among multiple departments and increase the visibility of city coordinates for the delivery of services.

## Active involvement of the private sector

The private sector has always been considered a receptacle of innovation and efficiency, the two key ingredients for bringing any smart sustainable city's vision to life. Businesses are expected to usher in new and innovative technological solutions and services. Large global players, with their wealth of knowledge and resources, need to invest in R&D and develop standardised yet customisable solutions that can be replicated and scaled up around the world. Not just large global companies but also innovative start-ups and local players will play a critical role. Creative solutions and approaches of the former and the local understanding and connect of the latter will work to their advantage and create an equation of mutual gain for both businesses and citizens. Many businesses have mastered the art of collaboration and can utilise this experience in creating platforms that bring together various stakeholders to deliver the much-needed integrated solutions. Public-private partnership (PPP) has been hailed as the preferred route for developing smart and sustainable city projects around the world. Substantial evidence establishes that the strategic role played by the private sector is assisting cities in realising their smart and sustainable objectives. The World Business Council for Sustainable Development (WBCSD) Urban Infrastructure Initiative (UII) conducted an innovative global project between 2010 and 2014, wherein 14 leading global companies worked with 10 cities around the world. The project involved setting up the framework for a city-business collaboration right from the early planning stages of developing the city's smart and sustainable plan instead of involving businesses only during implementation. The project outcome clearly spelled out substantial benefits for the cities.



### Tapping innovative financial sources

The Indian government's smart city initiative has specified several possible funding sources—both conventional as well as innovative, in order to meet the 7.5 trillion INR amount required over 20 years. Besides central and state funding, the list includes possible funding from multi-lateral and bilateral development agencies, pooled municipal debt obligation facilities, municipal bonds, real estate investment trusts and infrastructure investment trusts. For specific needs, depending on the nature of investment required, cities may be able to tap a few other funding sources. Smart and sustainable projects centred on climate change mitigation and adaptation may access the Green Climate Fund (GCF) of the United Nations Framework Convention on Climate Change (UNFCCC). Recently, the National Bank for Agriculture and Rural Development (NABARD) was accredited by GCF as an implementing entity for undertaking climate change related projects in India. Projects with positive environmental benefits can also utilise the green bonds route which has seen a lot of activity in the recent past. Projects that are in the spirit of corporate social responsibility (CSR), as defined by the Companies Act, 2013, may attract funds from companies with significant unspent CSR budgets. Crowdfunding has also been identified as a potential route for supporting citywide projects.

#### Integrated approach in both planning and execution

The path towards becoming smart and sustainable will invariably require coordinated action by the multiple city stakeholders. The complex city management structure needs to work in harmony in order to deliver the city's vision. This will require steering away from the traditional system of different

city departments and agencies working in isolation towards a more integrated approach, both during planning as well as the execution of smart and sustainable strategies. A governance model with clearly defined leadership roles needs to be established to work around the complex city administrative structure. Cities may establish a nodal agency that will work together with city officials and policy-makers, in order to ensure that municipal strategies and urban planning targets are completely aligned with the city's overall smart and sustainable vision. This agency will be able to drive active collaboration and can serve as the single window for all stakeholders.

Institutional factors for achieving sustainable cities:

- Good governance
- Planning
- · Legislation and policies
- Financing
- · Public and private cooperation
- · Education, training and development

### *Governance for a sustainable* future

Responsibility and accountability are integral towards making our community more sustainable. People, communal groups, organisations and businesses must recognise that the decisions they make affect the sustainability of our community. Administrations need to be accountable and responsive to their citizens, transparent in their reporting on the use of public resources and in decision-making, and create opportunities for participation in policy as well as service delivery. Good governance serves as a powerful inspiration for promoting reforms in policies and programmes for sustainable development. These include open and transparent opportunities for the poor and underprivileged to access

information and secure their rights over land, forest and energy resources, as well as to encourage governments to implement policies that are more amenable. We must hold each other responsible for the community's sustainability and for providing future generations with environmental, economic and social resources that meet our needs.



## How to use this report

The core objective of this report is to highlight the importance of converging smart with sustainable and driving action. We hope the key performance indicators (KPIs) and good practices in the report will help government authorities, decision-makers, city planners, consultants, entrepreneurs and investors to view smart cities through the sustainability lens and work together.



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