Making cities smart and sustainable

Contents
Cities: Why smart and sustainable p4
Smart sustainable city: Getting there p10
References p14
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.

Neel Ratan
Leader, Government and Public Sector
PwC India
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.

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:

"Sustainable cities (SC) can be understood 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 mind: 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 decision-makers."

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.

5. ‘How smart are our cities’, PwC and Express Technology Sabha Report
6. The International Telecommunication Union (ITU) is the United Nations agency specialising in the field of ICTs.
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

- **End poverty in all its forms everywhere**
  - Smart city pillars: Human rights, Social inclusion, stakeholder engagement and participation
  - Sustainable city pillars: Make cities and human settlements inclusive, safe, resilient and sustainable

- **End hunger, achieve food security and improved nutrition, and promote sustainable agriculture**
  - Smart city pillars: Sanitation, public health and safety, Water and air quality, Sanitation, public health and safety
  - Sustainable city pillars: Climate change mitigation and adaptation, Water, waste and energy management, Water, waste and energy management

- **Ensure healthy lives and promote wellbeing for all at all ages**
  - Smart city pillars: Sanitation, public health and safety, Smart healthcare, Smart healthcare
  - Sustainable city pillars: Sustainable transport, Green buildings, Climate change mitigation and adaptation, Green buildings

- **Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all**
  - Smart city pillars: Education and capability building, Incubators, skill development centres, specialised business parks, hubs, etc.
  - Sustainable city pillars: Promote sustained, inclusive and sustainable economic growth, full and productive employment, and decent work for all, Employment growth and opportunity, Incubators, skill development centres, specialised business parks, hubs, etc.

- **Strengthen the means of implementation and revitalize the global partnership for sustainable development**
  - Smart city pillars: Employment growth and opportunity, Competitive economy, Incubators, skill development centres, specialised business parks, hubs, etc.
  - Sustainable city pillars: Ensure access to affordable, reliable, sustainable and modern energy for all, Ensure availability and sustainable management of water and sanitation for all, Affordable housing, Smart surveillance

- **Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation**
  - Smart city pillars: Smart water management, Smart energy management, Smart energy management
  - Sustainable city pillars: Promote sustained, inclusive and sustainable economic growth, full and productive employment, and decent work for all, Employment growth and opportunity

- **Ensure sustainable consumption and production patterns**
  - Smart city pillars: Green buildings, Smart water management
  - Sustainable city pillars: Climate change mitigation and adaptation, Water, waste and energy management

- **Make cities and human settlements inclusive, safe, resilient and sustainable**
  - Smart city pillars: Incubators, skill development centres, specialised business parks, hubs, etc.
  - Sustainable city pillars: Natural resource management, including biodiversity and green cover

- **Promote sustainable development, build effective, accountable and inclusive institutions at all levels**
  - Smart city pillars: E-governance and citizen services, Governance
  - Sustainable city pillars: Natural resource management, including biodiversity and green cover

- **Ensure peace and promote justice for all, and build effective, accountable and inclusive institutions at all levels**
  - Smart city pillars: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
  - Sustainable city pillars: Improve institutional capacity at all levels, Governance

- **Revive the natural resource base of marine and coastal ecosystems and protect and preserve the cultural identity of marine and coastal communities**
  - Smart city pillars: Promote natural resource management, including biodiversity and green cover
  - Sustainable city pillars: Promote natural resource management, including biodiversity and green cover

- **Achieve gender equality and empower all women and girls**
  - Smart city pillars: Human rights, Social inclusion, stakeholder engagement and participation
  - Sustainable city pillars: Human rights, Social inclusion, stakeholder engagement and participation

- **Ensure availability and sustainable management of water and sanitation for all**
  - Smart city pillars: Sanitation, public health and safety, Water and air quality
  - Sustainable city pillars: Sanitation, public health and safety, Water and air quality

- **Ensure access to affordable, reliable, sustainable and modern energy for all**
  - Smart city pillars: Smart energy management
  - Sustainable city pillars: Smart energy management
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 focuses 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 city-wide 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.
References


Smart sustainable cities: Definition and challenges’, Mattias Höjer and Josefin Wangel, KTH Royal Institute of Technology, Stockholm, Sweden

Liveable and sustainable cities: A framework, Centre for Liveable Cities, Singapore and Civil Service College, Singapore

Indicators for sustainability: How cities are monitoring and evaluating their success, Sustainable Cities International (SCI)


ITU-T Focus Group on Smart Sustainable Cities, Key performance indicators definitions for smart sustainable cities

Setting the stage for stakeholders’ engagement in smart sustainable cities, ITU-T Focus Group on Smart Sustainable Cities

Innovative city-business collaboration, Urban Infrastructure Initiative – Framework for city-business collaboration, WBCSD and ICLEI

Solar Mosaic, Inc. https://joinmosaic.com/

Master plan for smart sustainable cities, ITU-T Focus Group on Smart Sustainable Cities


About PwC

PwC helps organisations and individuals create the value they’re looking for. We’re a network of firms in 157 countries with more than 195,000 people who are committed to delivering quality in Assurance, Tax and Advisory services. Tell us what matters to you and find out more by visiting us at www.pwc.com

In India, PwC has offices in these cities: Ahmedabad, Bengaluru, Chennai, Delhi NCR, Hyderabad, Kolkata, Mumbai and Pune. For more information about PwC India’s service offerings, visit www.pwc.com/in

PwC refers to the PwC network and/or one or more of its member firms, each of which is a separate legal entity. Please see www.pwc.com/structure for further details.

Key contacts from PwC

Neel Ratan
Leader, Government and Public Sector
Email: neel.ratan@in.pwc.com

Rakesh Kaul
Partner, Government and Public Sector
Email: rakesh.kaul@in.pwc.com

NSN Murty
Director and Leader, Smart Cities
Email: nsn.murty@in.pwc.com

Surojit Bose
Director, Sustainability
Email: surojit.bose@in.pwc.com

Contributors
Ankit Gupta
ankit5.gupta@in.pwc.com

Molisha Mehra
molisha.mehra@in.pwc.com

Monica Bhatia
monica.bhatia@in.pwc.com