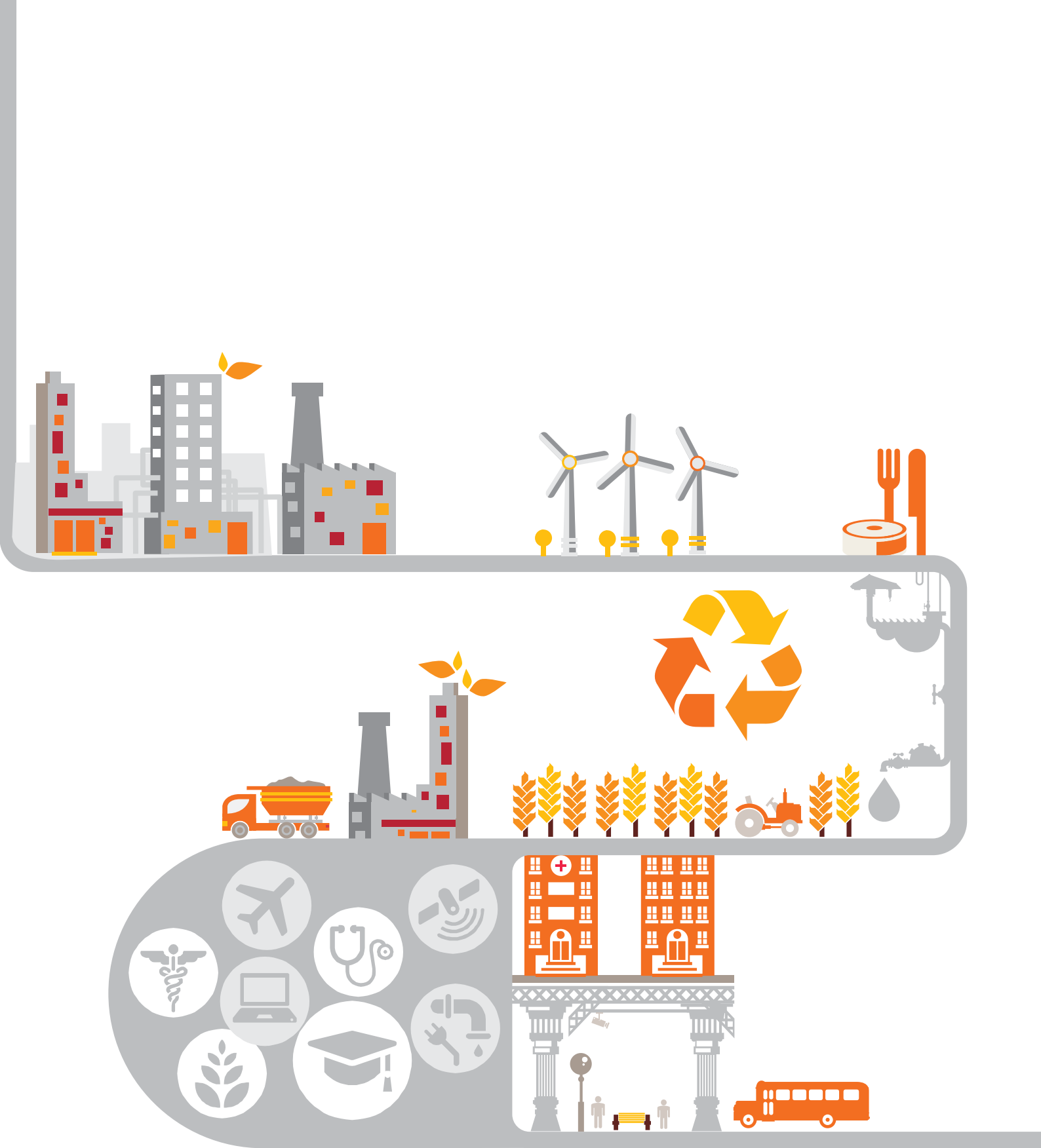

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Connecting the dots Smart and sustainable cities





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
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Cities: The journey towards 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 the global urban population in the near future.¹ 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 of 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.³

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.

India's urban population (% of total)²



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>



Currently, urban infrastructure is mostly developed without giving much consideration to sustainability. Cities have considerable potential to emerge as hubs that improve quality of life and minimise carbon footprints. Information and communications technologies (ICTs) also have an important role to play in the aggregation of data for a better understanding of city functioning in terms of services, lifestyles and resource consumption. This is the smart route.



Making smart sustainable

Sustainability and urbanisation pose big challenges to city commissioners and urban planners. Cities have to be engines of economic growth that provide equal opportunities for prosperity. They also have to liveable, connected, efficient, healthy, safe, inclusive, affordable and climate resilient. Ever since the advent of the notion of sustainable development,⁴ the idea of pursuing a sustainable urban development model for cities has been gaining increasing importance. Looking at urban development through the sustainability lens gave way to 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 - addressing economic/financial, social, and environmental issues.'*⁵

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.'*⁶

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 Sector (ITU-T)⁷ Focus Group on Smart Sustainable Cities (FG-SSC):

'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 progress, environmental stewardship and social development. According to the sustainability frameworks that exist around the world, sustainability 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 an individual path to becoming smart and sustainable.

4. According to the Brundtland Commission Report (1987) of the United Nations World Commission on Environment and Development, 'Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts:

- The concept of "needs", in particular the essential needs of the world's poor, to which overriding priority should be given;
- The idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.'

5. UN World Economic and Social Survey 2013

6. 'How smart are our cities', PwC and Express Technology Sabha Report

7. The International Telecommunication Union (ITU) is the United Nations agency specialising in the field of ICTs.



Smart city components

Institutional infrastructure

- E-governance and citizen services

Physical infrastructure

- Smart energy management
- Smart water management
- Smart waste management
- Urban mobility
- Smart communications
- Smart environment
- Smart spaces
- Smart surveillance

Social infrastructure

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

Economic infrastructure

- Incubators, skill development centres, specialised business parks, hubs, etc.



Sustainable city components

Economic progress

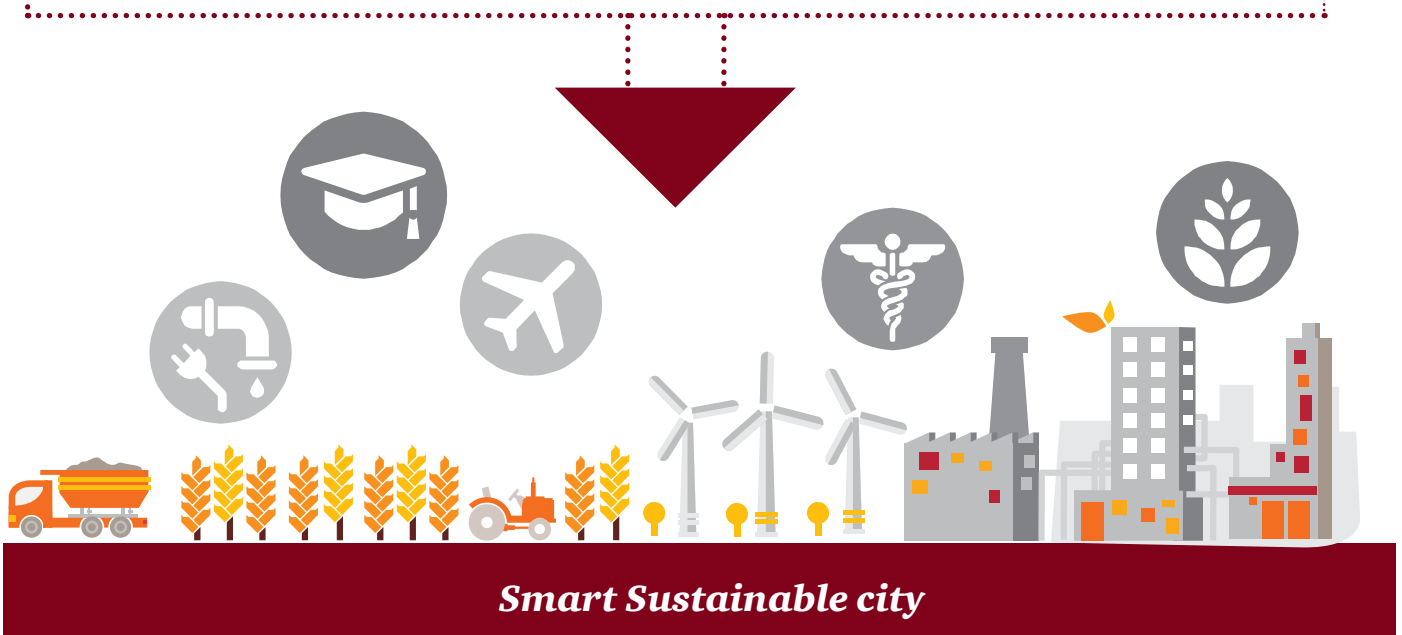
- Competitive economy
- Employment growth and opportunity
- Affordable housing
- Governance

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





● Smart city pillars ● Sustainable city pillars

Smart and sustainable city dashboard

Each city, with its own vision and plan, needs to work together with various stakeholders and define what 'progress' will mean over the course of implementing its plan. Measurable key performance indicators (KPIs) with corresponding targets and timeframes will have to

be defined and monitored continuously and the ensuing progress will have to be transparently reported and communicated to all the stakeholders. While every smart and sustainable city will have its own priorities and KPIs, an indicative list of KPIs is provided below:⁸

Economic progress and opportunity

Underemployment/employment/unemployment rates

Percentage of green jobs in the local economy

Average professional education years of labour force

Annual GDP and GNP growth

Net exports growth

Foreign direct investment

Measures of income distribution and inequality

Total support/programmes for small and medium-sized enterprises (SMEs)

Percentage of research and development (R&D) expenditure in GDP

Percentage of knowledge economy in GDP

Employment rate in knowledge-intensive sectors

No. of patents per 1,00,000 citizens

Energy and climate change

Energy consumption levels

Total amount of greenhouse gas (GHG) emissions (total and per capita)

Percentage of total energy consumed in the city that comes from renewable sources

Percentage of electrified households with metered connections

Housing

Home ownership rates

Percentage of social/affordable/priority housing

Breakdown of housing sector by property type (owner occupied/rental or single occupant/couples/family/multifamily, etc.)

ICT

Fixed and broadband internet penetration

Internet bandwidth

Tele-density

Electromagnetic frequency (EMF) compliance guidelines for telecommunication networks

Percentage of enterprises providing network-based services (e-commerce, e-learning, e-entertainment, cloud computing)

Proportion of business based on cloud computing

Proportion of business based on a geographic information system (GIS) (location, navigation, etc.)

Cybersecurity guidelines

Public health

Percentage of population with access to water-borne or alternative (and effective) sanitary sewage infrastructure

Mortality rate/life expectancy

Percentage of population with access to healthcare services

Percentage of electronic archival of residents' health records

Usage rate of electronic medical records

Sharing rate of resources and information among hospitals

Convenience of urban medical care

Coverage rate of household e-health services

Satisfaction with food/drug safety monitoring

8. Adapted from: '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); 'Smart London Plan'; 'Key performance indicators definitions for smart sustainable cities', ITU-T Focus Group on Smart Sustainable Cities

Green spaces

Park provision ratio (ha/1,000 population)

Percentage of preserved areas/ reservoirs/waterways/ parks in relation to total land area

Percentage of trees in the city in relation to city area and/or population size

Citizen satisfaction rate for public parks

Inclusion and participation

No. of citizens engaged through online government platforms (like MyGov)

City's performance, consumption, and environmental data to be made available as open data (energy, water, waste, pollution)

Convenience of government services

Improvement of turnout at public hearings by means of ICT

Penetration rate of government online services

Percentage of open government information

Safety

Crime rates

Penetration of city video surveillance

Accident prediction ratio

Citizen satisfaction with crime prevention and security control

Penetration of ICT for disaster prevention and alert system

Effectiveness of flood control monitoring by means of ICT measures

Fire stations per 2,00,000 citizens

Education

Adult literacy rate

Convenience for citizens to access education resources

Penetration of e-learning system

Educational institutes per 10,00,000 citizens

Buildings

No. of certified green buildings

Transport

Traffic congestion at peak hours

Public transport ridership

Transportation mode split. (percentage of each mode of transportation, i.e. private, public, bicycles, pedestrians)

Average commute time and cost

Citizen satisfaction with public transport

Convenience of smart traffic information service

Water, waste and air

Total amount of water availability

Reduction in leakage during water delivery/ unaccounted water

Level of domestic water consumption per capita

Percentage of metered water connections

Collection efficiency of water-related charges

Water that meets WHO drinking water quality guidelines

Access to clean drinking water sources

Number of days in a year where the Pollutant Standards Index (PSI) is in the 'good range'

Number of air and water pollution incidents in a year

Levels of particulate matter (PM10, PM2.5)

Recycling rate

Volume of solid waste generated

Solid waste disposal management with ICT measures

Proportion of pollution control by means of ICT measures: water, air, toxic substances, noise

Improvement in water usage (residential/industrial) by ICT measures

Improvement in electricity usage (residential/industrial) by ICT measures

Improvement in fuel usage by ICT measures

Improvement of rare metal usage with ICT measures

Percentage of efficiency of the collection and treatment of waste water

Percentage of efficiency in the collection of sewerage networks

Percentage of households covered by daily doorstep waste collection system

Percentage of collection of municipal solid waste

Percentage of segregation of waste at source

Percentage of coverage of road network with storm water drainage network

Incidents of waterlogging reported in a year

Percentage of rainwater harvesting

Smart sustainable cities: How to get there?

A smart sustainable city is a holistic city with multiple themes or components to ensure easy service delivery and quality of life for citizens. With the 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 the upcoming smart cities. The sustainability aspect is not just in terms of the environment but also has economic, social and governance dimensions. The three pillars of sustainable economic advancement, political participation and social emancipation are the core foundations of a smart sustainable city. A model city must have an open and responsive government that involves citizens in decision-making and a robust governance structure with a single nodal agency. Additionally, the city must have open data that is accessible to all, a robust model for city functioning and supportive regulatory systems that foster the culture of innovation and inclusiveness. Moreover, the involvement of the private sector sets up new benchmarks for making cities smart and sustainable through funding, entrepreneurship and innovation. Sustainable funding is imperative to ensure a smoother journey towards city transformation. We have listed best practices from around the globe that contribute to the development of smart sustainable cities.

Engaging citizens in 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 a 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. We will now take a look at the citizen engagement programmes for governance in India and Singapore.



Making Indian citizens a part of decision-making and contributing towards good governance with MyGov



MyGov is an internet-based platform and mobile app for citizen engagement. The portal, launched in 2014, is a one-of-its-kind interactive platform that solicits ideas, views and suggestions from citizens, irrespective of their location. The innovative platform allows people from all walks of life to participate in policy formulation and execution, as well as share their perceptions directly with the Prime Minister of India. The main objective of MyGov is to establish a link between citizens and the government, as well as to empower people to contribute towards *Surajya*. The portal helps the government to crowdsource suggestions for policies and national schemes, as well as seek ideas for discussion points for national and international addresses by the Prime Minister. MyGov enables citizens to participate in polls, tasks and discussions initiated by states, union territories (UTs), ministries and various government departments. The portal and app facilitate action, impacting change from the grass-roots level in policy-making.

- MyGov has driven various transformations ranging from education and Digital India to Clean India.
- MyGov is facilitating the revamp of the National Education Policy, making it less resource and time intensive.
- The Innovate for Digital India Challenge on MyGov was implemented to foster innovation and nurture innovators with guidance from Intel and IIM Ahmedabad's Centre for Innovation Incubation and Entrepreneurship to develop groundbreaking solutions.
- Logos for many of the national schemes such as Swachh Bharat, Digital India, FCI Depots and the National Education Policy have been crowdsourced through MyGov.
- MyGov is seeking inputs from people to create a mobile app for the Prime Minister's Office. Over 50,000 ideas were received on app features, and more than a 100 submissions were received during the designing phase.

REACHing out to citizens for their inputs on national and social issues in Singapore



How they are doing it



Reaching Everyone for Active Citizenry @Home (REACH), launched in 2006, is a government-to-citizen portal. The portal aims to make Singapore a cohesive society by engaging with citizens on social and national issues. REACH intends to encourage conversations between Singaporeans and the government, collaboration and community participation. The portal is gathering and gauging public ground sentiments, as well as highlighting issues to the government. REACH is promoting citizen involvement by encouraging citizens to become involved in shaping public policies through public consultation on varied topics. REACH has both conventional as well as online feedback channels such as SMS, email, a toll-free hotline, discussion forums, as well as Twitter and Facebook. For deeper engagement, face-to-face sessions are also conducted in the form of dialogue sessions and public forums. The portal is also closely working with professional groups, voluntary welfare groups, grass-roots and community organisations, as well as special interest groups for connecting people with varied interests and backgrounds. People can participate in discussion forums, public consultations and e-polls to engage with REACH. The portal also brings together people and the private sector through the REACH supervisory panel that includes Members of Parliament as well as people from business and professional groups, youth groups, media, the grass roots, women's groups, trade unions and the special needs sector. Additionally, the portal has a REACH Youth Ambassador Programme for nurturing future young leaders.



Impact

- Public consultation occurs on key issues and refinement of policies is possible based on feedback received.
- REACH Listening Points, which are open concept booths, are used to share information and gather feedback on national policies.
- REACH received nearly 45,200 feedback inputs from Singaporeans in 2014.
- REACH has over 38,000 likes on Facebook and more than 14,000 followers on Twitter.

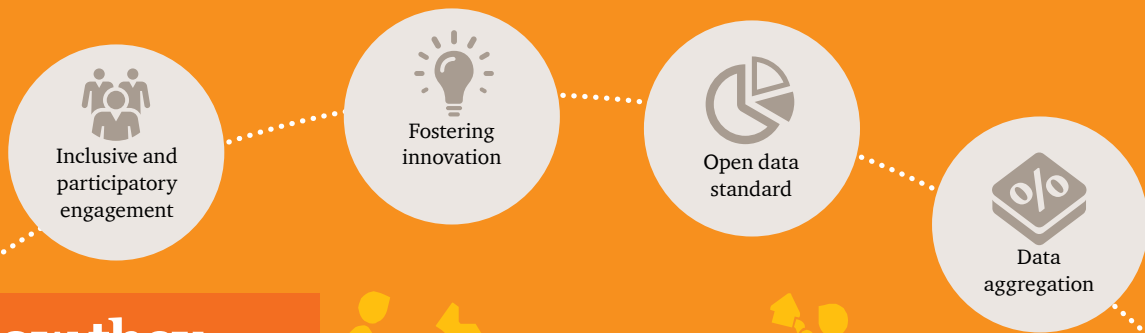
Opening up data for transparency and service delivery

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.⁹ 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 facilitates coordination among multiple departments and increases the visibility of city coordinates for the delivery of services.

9. <https://okfn.org/opendata/>

London Datastore: Making data open and accessible to improve city functioning and service delivery



How they are doing it



London Datastore, one of the first platforms for open data across the globe, is making public data open and accessible to enhance the accountability and transparency on city functioning. It is working with different communities and companies to create, maintain as well as utilise the data. The core objective of London Datastore is to identify as well as prioritise the data required to address growth challenges of the city in the city's infrastructure plan. Also, London Datastore will collaborate with public and private sector firms for creating, maintaining and utilising data as well as enabling common standards for data. Other EU cities will collaborate to create a common platform for an advanced version of London Datastore, which will aggregate data sets for enhancing the co-creation of services. A dashboard is available for engaging Londoners and involving them in city functioning. Apart from developers, the data is accessible and meaningful for citizens, enabling them to track public sector performance. Going forward, London Datastore will open up data standards as well as customise and simplify data sets for facilitating engagement between citizens, service providers and policy-makers.



Impact

London Datastore is encouraging the development of new services and products as well as creating new markets. With more than 30,000 visits in a month, Datastore has facilitated the creation of 450 transport apps. London Datastore will support the development of new business models as well as enable the development of more efficient and cost-effective services for citizens of London.

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 Initiative¹⁰ (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.

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

Collaborating with private sector players for sustainable mobility in Indore



How they are doing it



Indore is one of the fastest growing cities in India and wants to improve mobility using a multimodal public transport system. Atal Indore City Transport Services Limited (AICTSL) signed an MoU with WBCSD for preparing a mobility plan in July 2014. The city is collaborating with mobility-related private players for developing its sustainable mobility plans through WBCSD's Sustainable Mobility Project 2.0 (SMP 2.0). The project brings together a global cross-sector group of mobility-related companies that work collectively to develop the engagement process, methodology as well as the tools, and provides inputs to the city project teams. The Indore project team consists of Ford Motor Company (the host company for the Indore project), BMW, Brisa, Fujitsu and Volkswagen. This group of multinational companies forms the SMP2.0 City Task Force and works with city officials and local stakeholders such as the private sector, non-governmental organisations (NGOs) and citizens. The project involves an in-depth assessment of Indore's current state of mobility and economic barriers, development of sustainable mobility indicators and identification of solutions. The WBCSD SMP 2.0 is an excellent example of how private sector companies can support the sustainable transformation of a city in critical areas such as sustainable urban mobility. This is driven by their involvement in the early stages of strategic planning, data gathering and assessment.



Impact

A comprehensive mobility plan for Indore is expected to be ready by October 2015. The project has already delivered calculations for a set of sustainable mobility indicators for monitoring progress along with the best practice cross-sector solutions in line with the city's priorities. The final mobility plan will include enablers, financing options, the timeframe as well as areas of deployment which will serve as the basis for a more detailed action plan to be developed by Indore. The project has also successfully forged a collaborative platform between the various municipal departments, citizen as well as business stakeholders, and transport organisations.

Private sector supported climate-friendly urban redevelopment in Bottrop, Germany



The Ruhr metropolitan area is Germany's largest urban agglomeration with a population of 5.1 million covering 11 cities, including Bottrop. The area has a strong industrial background in coal mining and heavy industries. However, due to the declining competitiveness of coal exploitation as well as stringent environmental standards and policies, the area saw a downturn in the 1970s and started transitioning to a service-based economy. Acknowledging the significant challenges in the post-1970s era, public and private stakeholders in the area have been working together towards sustainable development. In line with this commitment, the Ruhr Initiative Group, a non-profit consortium of around 70 leading companies including RWE, Siemens and Bayer MaterialScience, launched a competition called InnovationCity Ruhr. The winning city was to be given a chance to become the model city for climate-friendly urban redevelopment and sustainable economic development for the entire Ruhr metropolitan area over the next 10 years. Bottrop emerged as the winner and has been pursuing ambitious climate-friendly projects ever since. It aims at reducing its CO2 emissions to half of what they currently are by 2020 while simultaneously enhancing the overall quality of life for its citizens. As part of its winning application, the city proposed to transform seven districts encompassing 70,000 inhabitants and 14,000 buildings into a pilot area for climate-friendly urban development through individual projects covering areas and measures such as retrofitting, energy, transport, industry and green spaces.

To manage and execute the long-term plan, a limited liability company, Innovation City Management (ICM) was founded in 2011 with five shareholders: The Ruhr Initiative Group, the city of Bottrop, a local energy company, a real estate company and an industry and public sector consultancy. ICM is the central steering body that initiates, monitors and supports individual projects as well as acts as a hub for exchange. It is the facilitator between the intervening stakeholders and actors from the various institutional spheres. Most of the 240 million euros invested so far have come from the private sector. ICM's start-up funding came from the Ruhr Initiative Group but, today, the company is mainly financed through partnership agreements with the private sector. ICM also generates its own stream of revenue through consulting services.

More than 200 individual projects have been initiated since 2010 and an additional 170 will be implemented by 2020. These include energy-efficient buildings (new and retrofitted), energy self-sufficient commercial buildings, 100 cogeneration systems, sustainable truck routing and rainwater harvesting. The city's work has won numerous awards, including the German Sustainability Award 2013. In 2014, Bottrop became the first local government to be awarded a prize by the German CSR Forum. Bottrop has successfully embraced the three pillars of sustainability—environment, economy and society—through multi-stakeholder engagement as well as cooperation between the private and the public sector.

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.

Oil and Natural Gas Corporation (ONGC) is developing a CSR waste-to-energy project in Puri.



How they are doing it



ONGC, under the guidance of the Ministry of Petroleum and Natural Gas, in line with its commitment to the Swachh Bharat Abhiyan (SBA) has taken up a waste-to-fuel project in Puri, Odisha, as a part of its CSR. ONGC, with a CSR spend of around 495 crore INR in 2014–15, intends to set up this plant in Puri as a pilot project. The project is meant to exploit untapped renewable energy resources such as municipal solid waste (MSW) in order to augment energy availability in Odisha. The project is in its initial stages and a multi-disciplinary team has been set up to take it forward. ONGC has also invited expression of interest for identifying technology and prospective bidders. The plant will be based on a build, operate and maintain (BOM) model, with a contractor taking single point responsibility and ONGC providing the necessary capex for installation as well as commissioning of the project.



Impact

The project is yet to be implemented but is expected to generate environmental benefits such as reduction in the waste that goes to a landfill and generation of cleaner electricity.

Crowdfunding clean energy projects



Energy management



Climate change mitigation

How they are doing it



Mosaic, a US-based marketplace lending firm, provides a unique crowdfunding platform allowing investors to lend their money for supporting rooftop solar power projects and earn a return on their investment. The revenues from the sale of power post-installation are used to repay the lenders. The company basically allows a large number of small non-accredited investors to invest in clean energy projects. Mosaic works through a mobile application to connect high-quality borrowers going solar with investors.



Impact

The borrower gets clean energy and benefits from savings as solar power is more economical than power from the utility.

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, 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

Long-term approach

“The core of sustainable development is meeting the needs of the present without compromising the ability of future generations to meet their own needs.”¹¹

Currently, over half of the world's population resides in cities. This urbanisation development is anticipated to continue and more than 80% of civilisation is expected to live in cities by 2050. Conditions for city inhabitants depend not only on how urbanisation is planned and managed but also on the cities' foundation, progression and use of resources. The choices cities make significantly impact the level of sustainability that is possible in the future. They drive economic growth, consumption of materials and energy, production of waste, and GHG emissions. If we are serious about conserving our natural resources, reducing climate change and bringing about a green economy, we will need to generate more employment and alleviate scarcity.

Urban sustainability today is threatened by sharp global uncertainty and transformation. These changes broadly consist of the following global factors:

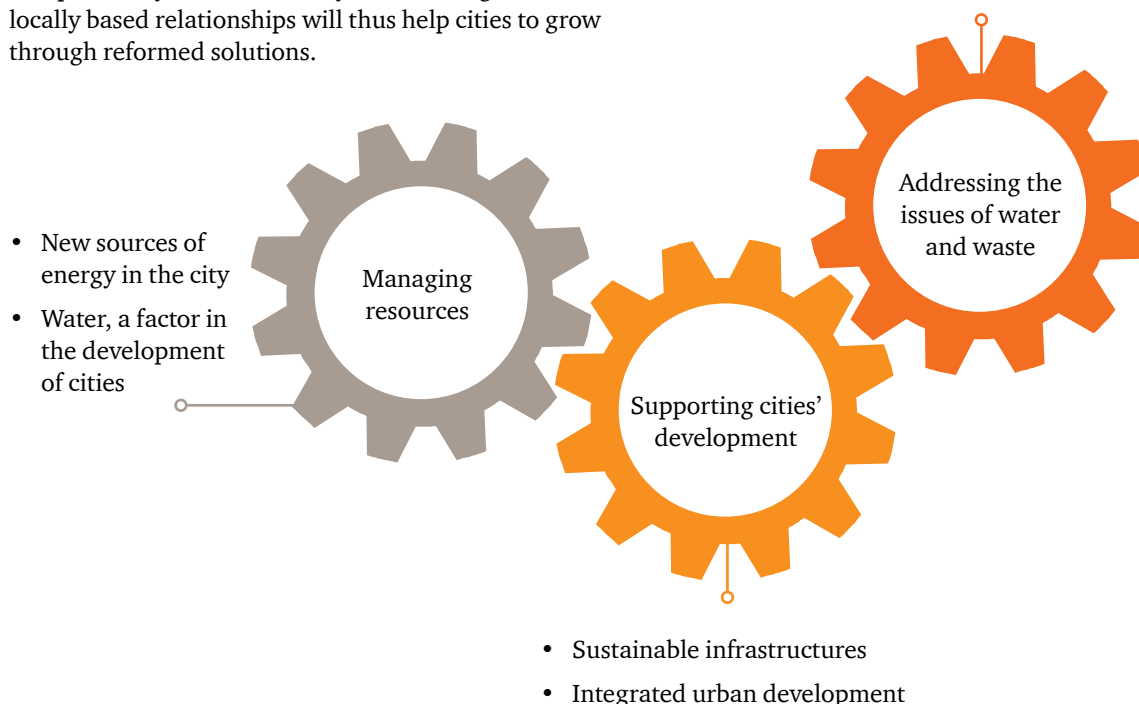
- Fiscal change
- Lack of resources
- Technological and social change
- Environmental and climate change

11. 'Governance for sustainable development', UNDP

These factors threaten multiple sectors such as food, water, energy, transport and waste, which are indispensable components of urban sustainability.

Enhancing the urban environment quality has consistently been a priority for policy-makers. However, ensuring the rationality of urban policies has always been a challenge. There are many institutions—both sectoral and regional—with different goals, and strategies are often implemented independently to contradictory effects. Long-term and locally based relationships will thus help cities to grow through reformed solutions.

- Protected breathing environment
- Innovative and responsive environment
- These three aspects contribute to an attractive and harmonious city.
- A city with a sense of community and in touch with its citizens
- A great place to live



Governance

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.

Governance as a challenge

Cities will progressively become the main focus of governance in the coming years. While they are the primary source of fiscal as well as economic growth, they are also the main reason behind GHG emissions. It will be wise to anticipate and prepare for increased challenges in terms of the supply and allocation of resources, especially for energy, water, transport and housing.

Sustainable cities will be better placed to offer greater access to information, citizen participation and involvement, institutional capacity building and skill development, accountability and resilience.



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 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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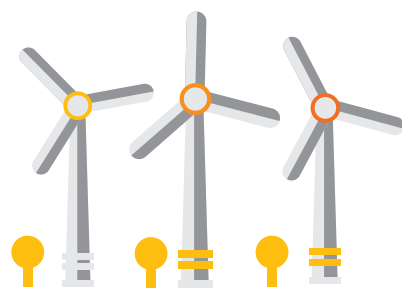
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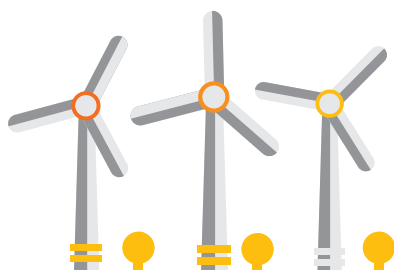
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