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Urbanization and sustainable smart cities: A global prospective

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Abstract
The predictable growth of cities produces exceptional sustainability challenges. Increasing demands for water, sanitation, education, healthcare, housing, transport, energy and public service are testing the limitations of the infrastructures available in the city. In these cities people lived in temporary housing lacking basic services, like sanitation and access to safe drinking water. Every year, millions new people move to such housing, increasing the demand for services. Cities are responsible for 67 percent(approximately) of the global energy demand and consume 40 percent of world's energy in overall. On the other hand, these cities are responsible for about 70 percent emissions of global greenhouse gases, contributing to climate change. In addition, these centers experience increasingly natural disasters also. In this way, they also have to witness social tensions created by rising levels of inequality and unemployment, air and water pollution, traffic jam, violence and crime, etc. Meanwhile, cities offer great opportunity for economic development. About eighty percent of the world's gross domestic product gets generated in cities. On average, the earning of urban citizens is three times than those of their rural counterparts. Cities also have center of universities and are critical venues of research and innovation, political activities and cultural exchange. People living in larger cities tend to have a smaller energy track requiring less road and communication facilities. They also consume less resources, and have higher levels of productivity. Smart Cities have emerged as one response to the challenges and opportunities created by rapid urbanization. This paper reveals that Smart Cities advance sustainable development. It also includes that how our cities grow and how the challenges faced by cities can be addressed. As cities are engines of growth of any nation, so their sustainable development is primarily required.

Keywords: smart cities, urbanization, development, planned growth

Introduction
Since the Industrial Revolution human development had serious impacts on the environment, and the growth and destructive actions of human society have resulted in negative impacts on the Earth's sub-systems (Steffen *et al.* 2011). Therefore, we are facing a systematic sustainability challenge, in which human behaviour can't keep on on the same course without having considerable negative impacts on future generations ability to meet their needs. Sustainability need significant and widespread changes in human behaviour. The global urbanization trends are creating a necessity to find smarter ways to deal with the associated challenges. Therefore, sustainable cities have become a highly desired goal for future urban development.

Urbanization and its Challenges
Cities have many different features compared to rural areas, such as: higher concentration of people with fast population growth, tertiary and quaternary economic activities, higher income than in rural areas in the same country; educational institutions (universities), research centers and leading companies, cultural activities and significant number of venues where such activities can be performed like, e.g. theaters, cinemas and exhibition halls; and the presence of trading centers. In addition, research and development, scientific innovations and engineering breakthroughs mainly occur in cities. Cities are places where most political affairs are settled down (Sacks 2015). While most economic activities, i.e. about 80% of the world's GDP, occur in cities, such development creates various challenges. In addition, there has been a sharp increase in instances of social instability in major cities across the world due to rising inequalities, unemployment and other factors. Air and water pollution, traffic congestion, and urban violence and crime also constitute major challenges to urban governments and policymakers. Global issues are such as:

1. Globally humans have built cities for 3 billion people over the course of 3000 years and in the next 30 years we will built cities for 3 billion more people (wwf Sweden, 2012).
2. 828 million people live in temporary housing, lacking basic services such as drinking water and sanitation. Each year, the figures increases by 6 more million people (UNDESA 2015).
3. One in four urban citizens does not have access to improved sanitation (UNDESA 2015).
4. About 27% of the urban population in the developing world has no access to piped water.
5. Cities account for about 67% of the global energy demand (The World Bank 2014).
6. Buildings represent about 40% of the total energy consumption (IEA 2015).
7. Cities are responsible for up to 70% of harmful greenhouse gases (UN-HABITAT 2011).

Growth of Cities

The world urban population growth translates into the growth of cities of all sizes. Figure 1, (given below) depicts the growth of the number of cities in four categories (UNDESA 2014c). Such growth produced shifts in the definition of megacities. While in 2005 UNDESA considered all cities above 10 million inhabitants as megacities (UNDESA 2006), a few years later UN Habitat raised the bar for megacities to 20 million inhabitants (UN-HABITAT 2008).

Figure no. 2 depicts the distribution of the 28 mega-cities across continents: Asia – Tokyo, Delhi, Shanghai, Mumbai, Osaka, Beijing, Dhaka, Karachi, Buenos Aires, Calcutta, Chongqing, Manila, Moscow, Guangzhou, Tianjin, Shenzhen and Jakarta; Latin America – Mexico City, Sao Paulo, Buenos Aires and Rio de Janeiro; Africa – Cairo, Lagos and Kinshasa; 3 in Europe – Istanbul, Paris and London; and North America – New York and Los Angeles. While figure 3, shows this distribution between developed and developing countries.

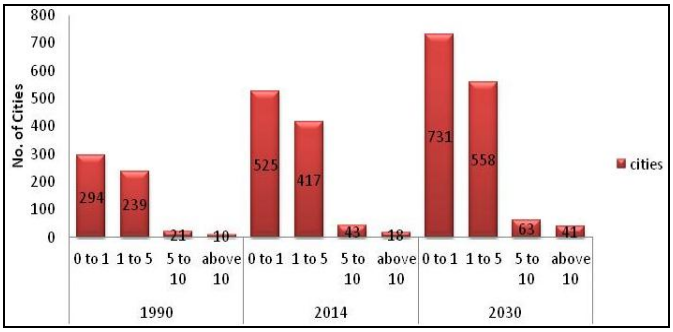


Fig 1: Growth of Different Cities

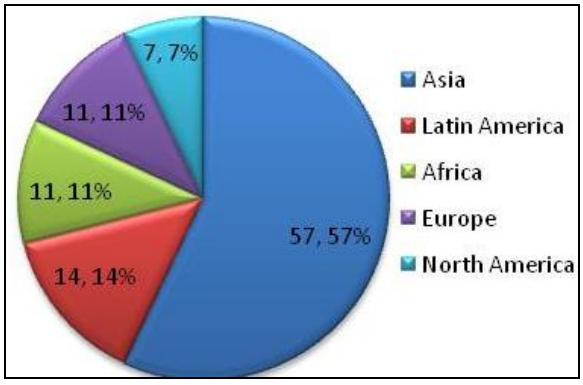


Fig 2: Mega Cities Across the Continents

Urbanization and Sustainability

Based on the urbanization trends and challenges, a key question for local governments, planners policymakers, and citizens is how cities could be made sustainable. Briefly, a city is sustainable if it promotes different dimensions of sustainable development, such as; economic – a city with a healthy, dynamic and responsible economy; social – a city promoting social inclusion and quality of life of its residents; environmental – a city adopting ecological practices to protect its environment; and institutional – a city governed in transparent ways, while engaging its residents.

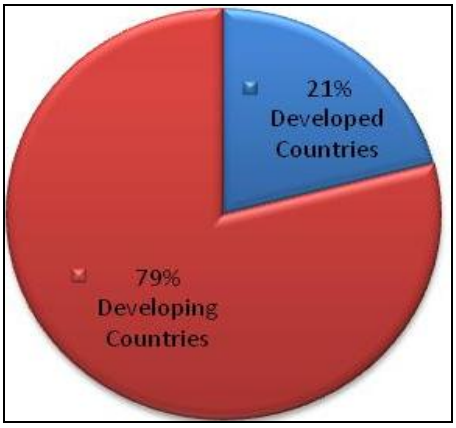


Fig 3: Showing the developed counties

In addition, sustainable cities are rebound to natural and human-made disasters. While, following urban sustainability, planning of cities including provision of electricity, water, sewage, waste management and other utilities, digital, transport infrastructure, public services, education and governance is critical. Core city development issues should not be left to commercial interests only but also treated and protected as public goods.

Concept of a Smart Sustainable City

A smart and sustainable city is a holistic city having multiple themes to ensure easy services delivery and quality life for its citizens. With recent announcement of 98 smart cities aspirants by the government India has taken concrete steps towards the smart city transformation. As per the guidelines for smart cities released by the 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 liberation are the core foundations of a smart and sustainable city.

A smart city is one that uses technology to make best utilization of resources to make cities more proficient, sustainable and people-centered. The basis of a smart city concept is that apart from physical infrastructure, spongy infrastructure in the form of intellectual and social wealth is critical for contemporary urban development. This can br achieved through the use of technology, especially information and communication technology (ICT).

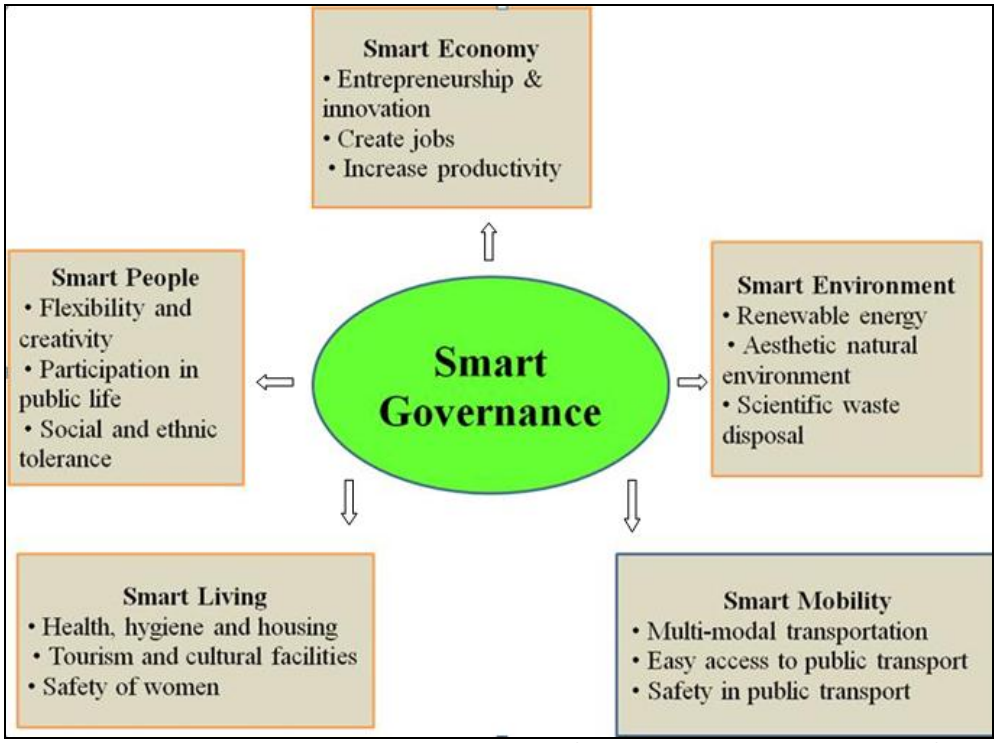
Need for Smart Cities

Last two decades have experienced upgraded urban infrastructure in many Indian cities. Now, modern airports, bridges, flyovers and expressways can be seen in most big cities of the country. However, the quality of urban services has not speed up with the population explosion in most of our major urban centers. Congestion has led to a space crisis, which is provoked due to lack of efficient and scientific utilization of urban space. The growing urban population puts unbearable pressure on the environment which contributes to

worse quality of lives of most citizens. The next transformation in urban India would engage placing the concerns of citizens at the centre of any urbanization strategy – something which smart cities have aimed to achieve in the next few decades.

Features

A smart city is characterized by smartness along multiple standards, with smart governance playing a vital role in enabling each of them. This is illustrated in the diagram given below:



***Source*:** http://www.smart-cities.eu/model.html, Ministry of Urban Development, Government of India

Fig 4

Approaches

Broadly, two approaches can be adopted for the development of smart cities –

a) Brownfield approach- it involves upgrading existing cities to make them smarter.

b) Greenfield approach- involves creating a new smart city within or an existing town or urban centre. This approach has been taken on a small scale by some States in India, as described later. A combination of these approaches would have to be adopted for the holistic development of cities. A new model city (Greenfield) could be developed to promote manufacturing and creation of jobs, while making existing cities smarter leading to better and more sustainable living conditions for the increasing urban population. Many pilot projects have been initiated in different cities of India to improve their living places. However, these were not part of a comprehensive plan to develop smart cities in India. In the next few years, these initiatives need to be scaled up as part of the Smart City Plan. Such smart projects include:

1. **Waste-to-energy projects –** This project includes conversion of solid waste into energy, a modern waste disposal method which serves two purposes. Firstly, it will reduces solid waste accumulation in the form of landfills. Secondly, it will generate energy which can be used for other purposes. This project already has been implemented by the Pune Municipal Corporation.
2. **Intelligent bus transport systems –** Mysore was the first city to implement a dynamic passenger information system (PIS) available on public displays at bus stops, bus terminals and the internet. This will allow passengers to plan their travel in advance, and encourages them to use public transport than private vehicles. The system is accompanied by GPS-enabled navigation systems and supported by an ICT network which allows the driver and the central control station to be in constant touch.
3. **Renewable energy** – The utilization of solar energy to meet up energy needs has the potential to make cities cleaner and greener. On the other hand, it enable to meet energy needs of the rapidly increasing urban population. In Greenfield (new) urban projects, renewable energy, such as; solar and wind energy could ensure continuous power supply for industries as well as other establishments in the city. It can enhance economic growth also.

Policy framework

The objective of smart cities can be achieved with the help of an enabling policy framework. This would involve effective coordination between Central and State governments and an improvement in the urban local bodies (ULBs). Some of the major element of such a policy framework would include:

1. **Public-Private Partnership** – Since smart cities depend importantly on technology, the proficiency and efficiency

of the private sector are important. Public-private partnership projects could be initiated in waste management, public transport and tourism development. Various types of public-private partnership models can be explored based on the necessity and other technical and financial considerations.

2. **Peoples' Participation** – The success of the smart city concept impossible without direct public participation. Community involvement could expedite land clearances. It could also aid to better understanding of problems related to health, hygiene and sanitation in a particular area, and develop cheap and innovative approaches to such problems. Water is a scarce and essential resource after land and air, especially in urban areas. Efficient utilization of water is also possible only through better community involvement. Finally, the complex yet critical task of rejuvenation of rivers in our cities can be achieved only through local people's participation.
3. **Urban Governance** – As discussed earlier, smart governance is the centre to the concept of a smart city. Many urban local bodies (ULBs) in India have been getting smarter through the use of ICT in their services. The assimilation of multiple municipal services (on a single user interface) can improve their efficiency and make them easily accessible to its citizens. In Maharashtra, the Pimpri-Chinchwad Municipal Corporation (PCMC) has already adopted such a type of model. However, improved financial health of ULBs would make this a success.
4. **Holistic planning** – As observed earlier, through the use of technology many pilot projects have been initiated by State governments and local bodies for urban development. But these projects have not been part of any holistic Smart City Plan. A holistic plan for the use of technology would lead to better utilization of scarce resources and more effective allocation of resources to different parts of the city. The process of planning itself should also use technology such as GIS-based mapping of cities. These policy initiatives can be encouraged by providing suitable incentives to the private sector, citizen stakeholders and the urban local bodies (ULBs).

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