

Achieving Sustainable Urbanization: A Study of Smart Cities

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ABSTRACT

By 2030, six out of ten people will live in urban areas. City dwellers must contend with increased congestion, waste and water management issues, and overcrowded, polluting transportation systems, all of which pose direct negative effects for citizens' physical health and wellbeing (*State of Green website*). Accommodation of the growing urban population in a sustainable manner is a humongous task in front of every country specially emerging economies like India. Very recently government of India has come out with the proposal of smart cities mission all over the country. This paper is an attempt to look into the concept and definition of 'smart city' and delve whether the 'technology' and 'ecology' would go hand in hand to meet the challenges and opportunities for sustainable urbanization. There is no universally accepted definition of smart cities yet and a smart city may have a different subtext in developing countries like India than any other developed country like United States. Even in India, the definition may vary for different states. The paper through an extensive study of literature around the world and examples of sample smart cities in India has tried to draw some significant insight about the concept.

Keywords: Sustainable, Smart, City, Urbanization, Environment

Introduction

Rapid urbanization is a global phenomenon. In 2008, for the first time in human history, there were more urban dwellers than rural, and the trends show that this is not going to be reversed (United Nations Issue Paper on Smart Cities and Infrastructure). This growth of population creates unprecedented sustainability challenges. Increasing demands for energy, water, sanitation, education, healthcare, housing, transport and public service are testing the limits of city infrastructures. In 2015, 828 million people lived in temporary housing that lacked basic services like sanitation and access to drinking water. Six million new people move to such housing every year, thus ever increasing the demand for services. Cities are responsible for 67 percent of the global energy demand and consume 40 percent of world's energy overall. Urban centres are responsible for 70 percent of global greenhouse gas emissions, contributing to climate change. In addition, urban centers increasingly experience natural disasters. They can also witness social tension brought on by rising inequality and unemployment, air and water pollution, traffic congestion, and urban violence and crime. Smart Cities have emerged as one response to the challenges and opportunities created by rapid urbanization (United Nations University: Smart Sustainable Cities, Reconnaissance Study).

This paper is an attempt to understand the concept of smart city and its ability to meet the challenges and opportunities of rapid urbanization. The paper has been divided into the following section. The second part of this paper has looked into the concept and definition of smart city. The next part has focused **on the domains that needed to be developed for building** smart city. The next part has focused on some **recent empirical evidence of smart cities across the globe and in India.**

Concept and definition of smart city

Smart concepts include smart transit, smart people, economy, living and smart management to improve quality of life, and new infrastructure, with prudent management of natural resources through government involvement (Schaffers et al., 2011 cited in Alkandari 2012). The concept of smart city has emerged very recently in India as the government launched 100 Smart City Mission in 2015. The mission specially calls for formulating and

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implementing smart solutions to overcome the challenges confronting various urban sector, such as water supply, sanitation, electricity, mobility, housing, energy and transport (MoUD 2015 cited in Aijaz 2015). The Royal Danish Embassy report on India`s smart cities stated that though smartness is generally associated with hi-tech and IT-based solutions, but in the context of India the definition focuses on establishing more efficient core infrastructure related to *water, electricity, sanitation, transportation and waste management*.

According to Smart Cities Expo 2020 “A smart city uses digital technologies and urban planning to enhance performance and wellbeing; to reduce cost and resource consumption; and to engage more effectively and actively with citizens.”

The Government of India`s website on smart city has incorporated some of the key infrastructure development under the smart city project which include the following:

- i. Adequate **water** supply,
- ii. Assured **electricity** supply,
- iii. Sanitation, including solid waste management,
- iv. Efficient urban mobility and public **transport**,
- v. Affordable **housing**, especially for the poor,
- vi. Robust **IT connectivity** and **digitalization**,

Though there is no universally accepted definition of Smart City in India, but there are some general guidelines and requirements that need to be fulfilled to develop a Smart City. Following Figure prepared by Smart City Mission Website of Government of India has enlisted the domain or sectors that are the main focused sector for development.

Figure 1: Smart City Solutions



Source: Smart cities Government of India Website (<http://smartcities.gov.in/>)

From the different domains/sectors in the above Figure 1, following are the 5 main development sectors which constitutes 78.9% of Smart City Mission budget for the top 60 cities (Anand et al 2018; 6th Smart Cities India Expo 2020) has been discussed in the following section.

1. Energy and ecology:

With a target of 100 GW solar power by 2021-22, India has emerged as a global leader in the adaption of solar energy. This includes ground-mounted (60 GW) and rooftop solar (40 GW) projects. India is currently No. 5 in global standings for solar installations. As on 31st March, 2019, cumulative installations of ground-mounted solar stood at 26,984 MW, while that of rooftop solar was 1,796 MW.

Key elements of Solar India will be:

- Ground-mounted & rooftop solar
- Floating solar
- Battery storage
- Solar cities
- Micro grids
- Solar street lighting
- Solar parks, etc

This sector has a budget of INR 22535.8 Crore and the bulk of these projects are area based at 77.5% In Energy and Ecology, the majority of funding is available for energy-based projects including renewable energy, gas, metering and distribution and constitutes 23.3% of the budget. The IT component of this project comes primarily from the metering, smart poles and allied projects. In terms of ecology, the project focuses on ecological restoration of land and water bodies.

2. Water and sanitation: India consumes 581 trillion litres of water annually, of this, a staggering 89% is used for irrigation, followed by 7% for domestic use, and 4% for industrial use. The country will need 1,200 billion cubic metres of water by 2025, and 1,447 billion cubic metres by 2050. The Government of India aims to connect 90% of rural households with piped water supply by 2022. The budget of this sector is INR 18861.1 Crore and is also largely area-based at 71.1%. The bulk of the projects focus on hard infrastructure, like sewerage, solid waste management and allied projects. IT involvement in this sector primarily consists of meters and other forms mechanisation of labour at 26%.

3. Housing: Sustainable infrastructure is an integral part of the Smart Cities Mission. As cities expand, it is imperative to invest in smart buildings and housing to enable cohesive development in the future. Key elements of Buildings India are:

- Housing for All & other government initiatives for the urban/rural poor
- Smart/green buildings
- Real estate & high-rise buildings
- Facilities management
- Building Information Modelling (BIM)
- Construction equipment & materials
- Connected homes & smart cities
- Security & surveillance
- Fire safety
- Smart lighting, etc.

The housing sector is the third largest development category with a budget of INR 16381.2 crore.

The very nature of this sector is area-based and thus Housing is 99.4% ABD, with only a smattering of projects with an IT component (0.2%). It is important to note that almost half the projects are devoted to real-estate development, while the other half is a motley of mixed and lower income housing. The rental market, hostels and night shelters play a very small role in this vision of smartness. *In-situ* and other forms of slum redevelopment have almost a fifth of the total value of the project. It is important to note, that redevelopment projects often result in significant dispossession as not all residents are able to prove tenure in the informal area and thus the project could result in making people homeless. (Dupont, V., et al. , 2014) (Zérah, 2009) While this is one of the largest sectors in the Mission, in terms of the budget, the sector is unevenly distributed over the top 60 cities with 5 cities accounting for over 65% of all housing projects.

4. Economy : This sector focuses clearly on projects with a strong focus on economic returns and has a budget of INR 11275.4 Crore. The primary focus of economy is commercial and retail activity, with a strong focus on market redevelopment projects and the new construction of offices, homes and allied institutions. Like housing, almost the entire budget is devoted to area-based projects at 99.2% and only 0.3% of the projects have an IT component. Furthermore, 5 cities account for over 67% of all the projects under this sector.

5. Transport: Indian cities are now home to millions of vehicles, including domestic or commercial, two-wheelers, three wheelers, buses and locally modified electric vehicles used to ferry goods and passengers within the city. Together, these contribute to traffic and parking congestion as well as air pollution, thereby raising health and safety issues. There is an urgent need to address the challenges related to the country's road transport sector, including

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inadequate public transportation, road safety, traffic management, parking infrastructure, etc. The SCM has a target of arranging 'Smart Transport' in the country, including:

- Electric/Hybrid/Alternate fuels vehicles
- Connected/Autonomous vehicles
- Storage/Batteries
- Public transportation
- Bus/Bus rapid transit system
- Rail/Metro Rail/Hyperloop, etc.
- Smart cards/Smart parking
- Traffic control rooms & systems
- Intelligent transport systems/Road
- Traffic systems (safety, security, surveillance), etc.

This sector has a proposed budget of INR 32,600 Crore (INR 326 billion), almost a quarter of the entire budget for the top 60 cities. In keeping with the Smart City guidelines, the sector is primarily focused on the ABD as 71.6% of transportation projects are area-based projects. The IT component in this sector is higher than the average of the Mission at almost 30%, due to the focus on traffic systems and information systems in public transit. The bulk of transportation projects are focused on roads and parking lots (almost 40%), while only 20% of the budget is focused on public transportation, only 2% of the entire transportation budget is focused on buses themselves. (Anand et al 2018).

A Framework for implementation of Smart City Mission

After one year of preparatory work, Smart City Mission was launched on June 25, 2015. The cities have been chosen through a competitive structure and 98 cities have been selected as a part of the Mission. These cities were not de-facto provided with funding and were expected to submit proposals to compete for a position in a hierarchy of smart cities. In terms of funding, each city would get INR 500 crore (INR 5 billion) from the central government. These funds are channeled through a Special Purpose Vehicle (SPV) that is created, in each city, to manage the smart city projects.

Area-Based Development and Pan-City Initiatives

Each SCP is expected to apply strategic planning principles and is to contain both **area-based development plans and pan-city initiatives**. There are three basic models for area-based development in cities, classified as **Retrofitting, Redevelopment and Greenfield**. Cities must utilise at least one of these methods or a mix thereof in the development of their smart city.

- Retrofitting, requires identifying and making existing built-up areas of over 500 acres efficient and livable.
- Redevelopment, for replacement of existing built-up areas of more than 50 acres by preparing a new layout plan.
- Green field area development around the cities, for carrying out new development in vacant areas of more than 250 acres, and
- Pan-city development, which implies application of smart solutions to various urban infrastructure sectors, such as transport, water and sanitation etc.

Evidences of Smart cities around the world and India

China: China has built some smart cities to accommodate its urban population in Guiyang, Wohan, Nanjing and Hefei. Some scholars term them as 'Ghost City' of China as these cities are left out with lesser inhabitants. China is developing new smart cities. China allocated \$322 Billion for smart city development by 2025.

Abu Dhabi: Abu Dhabi is investing \$22 billion for developing smart cities for 40,000 residential in Arabian Desert

South Korea: South Korea's smart city is endowed with waste disposal system where refuse is sucked underground directly from people's homes. Radio Frequency Identification (RFID) a tracking device fitted to cars to promote traffic signals to change route during periods of congestion and a video call presence screen fitted in every office and shopping center.

U.S.A: In Boston smart city gunshot sensor is fitted on the crowded place. Whenever there is a gun shooting in the region, sensor automatically alerts the local police.

In Iowa smart city, smart water meter is fitted in each household which can be helpful for comparison with neighbour's water uses and accordingly will help in water conservation.

Ireland: In Dublin smart city "parkya" app developed by IBM for finding out the available parking slots.

Denmark: In Copenhagen smart city the green wave cycling system coordinates traffic light so that cyclist who maintain a 20 km/ h travelling speed only see green traffic light all the way along their commute.

Paris: In Velib smart city has facilities of public bicycle sharing system.

India: India's first operational city is known as GIFT City (Gujarat International Finance Tec City), which developed between Ahmedabad and Gandhinagar. A green field project includes feature like district cooling system, utility tunnel and automated vacuum waste collection.

Pune: In Pune smart road with broad pedestrian, amusement park, solar street light, smart e- auto and smart e-bikes have started commuting.

Conclusion

In this paper we have tried to understand the concept of Smart City, the important domains/areas to be handled under Smart City Mission. The Framework for implementation of Smart City Mission and some empirical studies around the world and in India as to work as Lighthouse to the Mission. The Core Idea behind the Smart City Mission is, making the modern urban cities efficient, sustainable and livable with the usage of Information technology. Various ambitious projects have been started to different sectors starting from renewable energy usage, waste management, smart water management, smart transport etc. discussed in this paper. However, the work is still in progress and there is still a far way to go, to see the physical transformation of the cities.

Bibliography

- Aijaz, R., & Hoelscher, K. (2015). India's Smart Cities Mission: An Assessment. *ORF Issue Brief*, 124, 1-12. Retrieved from https://www.orfonline.org/wp-content/uploads/2015/12/Issue-Brief_124.pdf.
- Alkandari, A, Alnasheet, M and Alshekhly, I. F. (2012). Smart Cities: Survey. *Journal of Advanced Computer Science and Technology Research Vol*, 2(2), 79-90.
- Anand, A.,Sreevatsan, A. and Taraporevala, P. "An Overview Of The Smart Cities Mission In India." A Report By Centre for Policy Research. Retrieved from <https://cprindia.org/system/tdf/policy-briefs/SCM%20POLICY>.
- Creating smart, green and liveable cities. State of Green (Denmark). Retrieved from <https://stateofgreen.com/en/creating-smart-green-liveable-cities/>
- Smart Liveable Cities in India-Opportunities for Danish Companies. Retrieved from [Indien.um.dk.>media>smart city reports](http://Indien.um.dk.>media>smart%20city%20reports).
- Estevez, E., Lopes, N., & Janowski, T. (2016). Smart sustainable cities: Reconnaissance study. Retrieved from https://www.researchgate.net/publication/299388106_Smart_Sustainable_Cities_-_Reconnaissance_Study
- Lambole, P. R., Chouragade, P. "A Survey of India's Smart Cities Mission." *International Journal of Scientific & Engineering Research*, Volume 7, Issue 2, February-2016 ISSN 2229-5518.
- Report on Smart City in India. Retrieved from http://www.sesei.eu/wp-content/uploads/2018/08/Report-on-Smart-Cities-Mission-in-India_July_2018_Final.pdf
- 6th Smart Cities India Expo 2020. Retried from <https://www.smartcitiesindia.com/>