

# A Review on Innovation and Technology to Make A Smart City

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**Abstract**— Cities accommodate nearly 31% of India's current population and contribute 63% of GDP (Census 2011). Urban areas are expected to house 40% of India's population and contribute 75% of India's GDP by 2030. This requires comprehensive development of physical, institutional, social and economic infrastructure. All are important in improving the quality of life and attracting people and investment, setting in motion a virtuous cycle of growth and development.

**Keywords:** Smart City, Economic Growth, Green Building

## I. INTRODUCTION

### A. Smart city

A developed urban area that creates sustainable economic development and high quality of life by excelling in multiple areas, economic, mobility environment, people, living and Development of Smart Cities is a step in that direction. The Smart Cities Mission is an innovative and new initiative by the Government of India to drive economic growth and improve the quality of life of people by enabling local development and harnessing technology as a means to create smart outcomes for citizens.

Government. A city may be defined as smart when the investments in sociohuman capital, urban infrastructure, and rational management of natural encourage a sustainable economic development and a high quality of life through participatory actions and commitment from community members.

### B. Different between a smart city and a normal city

Smart City	Ordinary City
<ul style="list-style-type: none"> <li>- Developed facilities with new medical technologies in hospitals and dispensaries.</li> <li>- Upgraded municipal schools with new ideas of teaching and learning processes.</li> <li>- Segregation of garbage at proper source and sewage treatment plants well maintained.</li> <li>- Rehabilitation of hawkers and needy people with full government help and concern.</li> <li>- Roads and other construction sites well developed and properly maintained.</li> <li>- Low cost offers more convenience.</li> </ul>	<ul style="list-style-type: none"> <li>- Poor facility of hospitals and dispensaries with low grade technologies and medical system.</li> <li>- Old processes of teaching and learning with bad quality facilities.</li> <li>- No proper disposal places of sewage and treatment plants ill maintained.</li> <li>- No proper rehabilitation facilities for hawkers and needy people.</li> <li>- Roads and construction sites not properly developed or maintained.</li> <li>- Get less convenience at extra cost.</li> <li>- Less opportunity to get employment.</li> <li>- Poor facilities are present in ordinary city.</li> </ul>

<ul style="list-style-type: none"> <li>- More employment opportunities.</li> <li>- Better facilities are provided in smart city like Wi-Fi, smart transport, smart lighting, etc.</li> <li>- It provides better drainage system.</li> <li>- It helps in overall development in country.</li> </ul>	<ul style="list-style-type: none"> <li>- It doesn't provide better drainage system.</li> <li>- It doesn't help in development of country.</li> <li>- It doesn't give higher living standards to their citizen.</li> </ul>
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Table 1: Difference between Smart city and ordinary city

### C. Comparison between Indian smart city and foreign smart city

Pune	Singapore
<ul style="list-style-type: none"> <li>- The city can't detect if people are smoking in unauthorized zones or if people are throwing litter out of building.</li> <li>- The city did not have any software like virtual Pune unlike Singapore.</li> <li>- The city has invested in road sensor but did not have smart parking in the city which causes difficulties in parking of vehicles.</li> <li>- A city has Wi-Fi hotspot in selected areas of the city like parks, hospital, important public areas, etc.</li> <li>- 150+ variable message systems for broadcasting informative messages alert and city updates.</li> <li>- Affordable housing especially for poor.</li> <li>- E-buses are present in the city to improve air quality in the long run and reduce dependency on liquid fuel to the extent possible.</li> </ul>	<ul style="list-style-type: none"> <li>- The city can detect if people are smoking in unauthorized zones or if people know litter out of building.</li> <li>- The city has developed software called "virtual Singapore" a dynamic 3-D model that enables city planners to run virtual tests verifying, for instances, how crowds might evacuate from a neighborhood facing an emergency.</li> <li>- The city has aggressively implemented congestion charging while also making substantial investment in road sensors, phased traffic lights, and smart parking.</li> <li>- The city has Wi-Fi hotspot all over the city and has the one of the cheapest broad-band services all over the world.</li> <li>- No variable message system available for informative messages alert and city updates.</li> <li>- No such scheme is present in the city.</li> <li>- No such E-buses are present in the city</li> </ul>

Table 2: Comparison between Indian smart city and foreign smart city

**D. Introduction to Green City**

**1) The concept of green city**

The least approaches to urban to urban planning promote innovation concepts of future development of the word cities. These concepts are based on the principle that the city acts as a living organism with complex metabolism. The new urban concepts meant for this purpose, such as new urbanism, green urbanism, bio- phallic city, smart city, sustainable city, eco-city and green city. Whatever the name, the green city is a systemic entity, implicitly functional, able to absorb, store, convert and recycle matter and energy like a living organism. Apart from the usual urban components, the green city has also specific features: green and blue oxygen-producing areas, landscaped and environment-friendly buildings, road network adapted to eco-friendly vehicles, green energy, and sustainable waste management systems. With the expansion of urbanization and the overcrowding of the large cities, phenomena such as the physical, chemical and biological pollution, as well as the continuous increase of building density and waste amounts, are inevitable and difficult to manage. Under the circumstances, it is necessary to reconsider the principles of urban planning. In the current knowledge, the green city represents a viable strategy that combines all conceptual characteristics of the cities of the future (biophilic city, eco-city, smart city, sustainable city etc.). Urban planning is a concept that encompasses the entire set of prospective activities aiming at regulating the development of urban territorial systems. Urban planning can include urban renewal, by adapting urban planning methods to the existing cities suffering from decline. In the late 20th century, the term sustainable development has represented an ideal outcome in the sum of all planning goals.

**2) Green Houses**

A more recent trend is the returning to the old methods, techniques and building materials. However, the resulted buildings would fit better into the suburbs, not into the proper city. A new way of valuing housing traditions, blending energy efficiency with cultural- aesthetic values, is the use of the famous cob. The cob is a mixture of loam, sand, straw, water and earth that can be used for building sanitary dwellings with diverse architecture. These buildings are ecological from the point of view of construction materials, building technology, consumed energy, moisture content, and resistance to earthquakes, and durability. Cob houses automatically adjust moisture and maintain heat in winter and coolness in summer.

**3) The Green Buildings**

The construction costs of such a green building, although higher than those required by a conventional one, can be recovered over the years to come, as the costs of maintenance and energy will be reduced substantially. The advantage of this type of construction is that it allows an almost complete recycle of water resources and energy. The buildings are designed so that to use efficiently the energy, the water and other renewable resources. Energy efficiency is extremely important, most of the green buildings consuming 40% less energy than conventional edifices.

**E. Relation between green city and smart city**

The goal is to turn into Smart Cities, able to improve the quality of life of their inhabitants by offering a lasting opportunity for cultural, economic and social growth within a healthy, safe, stimulating and dynamic environment. Both share aspirations to reduce environmental burdens and improve human wellbeing. An analysis of the most interesting initiatives at the international level pursued by cities investigating the three main areas of Green Buildings, Smart Grid-Smart lighting, and Smart mobility is given, with the objective to offer a broad reference for the identification of development sustainable plans and programs at the urban level within the current legislative framework. The relation between smart city and green city can be maintain by using electrical vehicle because they are pollution free & are the smart solution for go green campaign.

**F. Difference between green city and smart city**

Smart City	Green City
The use of information and technology to manage the city. –Focus is on information & technology. –The core infrastructure elements are good governance, e-specially e-governance, safety & security, particularly women, children & health & education. –Houses in smart cities can be energy saving or cannot be energy saving. –Children’s cannot develop themselves better in smart cities due to new technologies & smart phones in which they always play with smart phones & they cannot be physically trained. –In smart cities due to high rise buildings & infrastructure due to that patient cannot feel or view the nature so that patient cannot recover fast. –In smart city there will be industries & factories due to which city cannot generate clean air, smart cities do have filters for purification purpose but cannot generate clean air.	A city that embraces the dual goal of environmental protection and the quality of life of city residents. –Focus is on sustainable transport, architecture, urban design, and city planning, culture, heritage & diversity. –The core infrastructure elements are adequate water supply, sanitation, efficient & sustainable urban mobility and sustainable environment. –Houses in green cities are energy saving. –In green cities children can develop themselves better in green environment & they are physically trained. –In green cities patient with a view of greenery patient can recover fast. –A green city generates clean air, as industries & factories are not situated there or they will be on very less scale as compared to smart cities.

Table 3: Difference between Smart City & Green city

## II. METHODOLOGY

### A. Different types of framework which involved in smart city

#### 1) Human framework

Human infrastructure (i.e., creative occupations and workforce, knowledge networks, voluntary organizations) is a crucial axis for city development.

##### a) Creative city

Creativity is recognized as a key driver to smart city and it represents also a version of it. Social infrastructures, like for instance intellectual and social capital are indispensable factors to build a city that is smart according to the human framework. These infrastructures concern people and their relationship. Smart City benefits from social capital and it could be possible and easier to create a Smart city concept if there are mix of education and training, culture and arts, business and commerce.

##### b) Learning city

Learning city is involved in building skilled workforce. This type of city in the human context improves the competitiveness in the global knowledge economy and established a typology of cities that are learning to be smart: individually proactive city, city cluster, one-to-one link between cities, and city network. That lead a city to learn how it should be possible and realistic to be smart through learning process followed by city workforce.

##### c) Human city

It exploits human potential, in particular the knowledge workforce. Following this approach, it is possible focus on education and builds a centre of higher education, which is the city, obtaining better-educated individuals. This view moves a smart city concept in a city full of skilled workforces; the same reasoning could be, make for those high-tech knowledge-sensitive industries which want to migrate in a so dynamic and proactive community. As a consequence of the above movement, the difference between Smart City and not are getting wider; Smart places are getting smarter while other places getting less smart because such places act as a magnet for creative people and workers.

##### d) Knowledge city

It is related to knowledge economy and innovation process; this type of Smart City is very similar to a learning city, the only difference refers to "a knowledge city is heavily related to knowledge economy, and its distinction is stress on innovation" The concept of knowledge city is linked with similar evolving concepts of Smart City such as intelligent city and educating city. The most important feature of this city is the fundamental concept of knowledge-based urban development, which has become an important and widespread mechanism for the development of knowledge cities.

#### 2) Energy Framework

##### a) Assuring 24X7 Power to all Smart Cities

- Energy powers the Technologies which are the foundations of Smart City.
- Assuring 24X7 Power to all Smart Cities.
- Energy should be operated with completely Smart Grid Technology.
- DC Powered Smart-city.

- DC wiring in every Home/complex of the smart city so as to efficiently integrate the Solar PV directly.
- Usage of DC-powered Appliances like LED lights and BLDC Fans.
  - b) Energy on Smart Grid Technology
- A smart city having a smart technology-based grid should be provided with ultrahigh speed internet, voice and video access to all the consumers, city wide Wi-Fi network for city and utility, street light controls, Surveillance cameras. This will help to manage automatic outage and faults in an elegant manner.
- Smart grids and meters India's sustainable energy challenge does not stop at generation but continues into the transmission and distribution (T&D) sector as well. As of 2012, T&D losses for electricity were 24% as reported by the Central Electricity Authority (CEA). This compares poorly to the world average of 9.8% in 2010. India's Southern Grid was only recently synchronized with the rest of India with the commissioning of the Raipur -Sholapur 765 KV line in December 2013.
- India has currently invested in the development of smart grids with some seriousness. 14 smart grid pilots have been approved. They will be evaluated as proof of concepts for techno commercial feasibilities and then scaled up. The purpose of the smart grids would be to essentially take care of the aggregate technical and commercial losses, renewable energy integration, peak load management, power quality improvement, creation of micro grids and distributed generation.
- Smart meters, though strictly speaking are essential for smart grid infrastructure, can also be viewed as a standalone area of intervention that needs to be addressed in parallel with reducing losses. Smart meters can allow power to be fed back into the grid from households that have a surplus (say through rooftop solar) while also Helping households monitor their consumption and lower their energy bills.

## III. LITERATURE REVIEW

The concept of smart city is relatively new and can be seen as a successor of information city, digital city and sustainable city (Yigitcanlar 2006). However it has been used frequently, especially after 2013, when it exceeded a frequency of citations of other terms including sustainable city (Yigitcanlar 2006). However it has been used frequently, especially after 2013, when it exceeded a frequency of citations of other terms including sustainable city (Jong et al. 2015; Yigitcanlar 2016). Despite the discussion about its concept in recent years, there is a lack of consensus on what a smart city is (Angelidou 2015; Hartz 2016). Although a number of authors have the difficulty of conceptualization, these definitions are not contradictory but partially overlapping (Scheel and Rivera 2013; Cocchia 2014). In general, however, it is understood that smart cities make use of information and communication technology (ICT) extensively to help cities to build their competitive advantages (Yigitcanlar and Baum 2008; Caragliu et al. 2011), or that it is a conceptual model where urban development is achieved through the use of human,

collective and technological capital (Angelidou 2014). The term smart city is, therefore, an umbrella concept that contains a number of subthemes such as smart urbanism, smart economy, sustainable and smart environment, smart technology, smart energy, smart mobility, smart health, and so on (Gudes et al. 2010; Cocchia 2014; Lara et al. 2016).

In their literature review, Caragliu et al. (2011) conceptualize smart city with the following main characteristics: (a) An enhanced administrative and economic efficiency that enables the development of culture and society by utilizing networked infrastructures; (b) An underlying emphasis on business oriented urban development; (c) A strong focus on the goal of realizing the social inclusion of different kinds of urban residents in public services; (d) An emphasis on the significant role of high-tech and creative industries in long-term growth; (e) A perspective to pay close attention to the function of social and relational capital in city development, and; (f) A vision to take social and environmental sustainability as an important aspect of smart city development. Some authors also point to the necessary ingredients for the composition of a smart city, such as: smart economy, smart mobility, smart environment, smart people, smart living and smart governance (Lazaroiu and Roscia 2012; Lee et al. 2014; Jong et al. 2015). Additionally, the concept of smart city goes beyond the definitions of information cities, digital cities, and intelligent cities, because it contextualizes technology to be used in favor of systems and services for people (Jong et al. 2015).

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