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RESEARCH ARTICLE

SMART CITIES IN INDIA: A SMARTER WAY TO BUILD 'NEW INDIA' THROUGH SMART CITIES

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Abstract

“Cities in the 21st century will account for nearly 90% of global population growth, 80% of wealth creation, and 60% of total energy consumption. It is a global imperative to develop systems that improve the livability of cities while dramatically reducing resource consumption.”

- **Massachusetts Institute of Technology**

Urbanization in India has historically been viewed as a by-product of failed regional planning. It is only now that it is being realized that it is inevitable. However, the policy and practice surrounding urbanization will only change when the benefits of urbanization overtake the costs involved, it is an opportunity for achieving faster growth.

Indian cities will grow faster than those of any other country in the coming years. By 2050, India will add over 400 million urban inhabitants, while China will see an increase of 290 million inhabitants over the same period.⁸ By 2030, seven Indian cities will have a population of over 10 million; in 2011, only Mumbai and Delhi had populations over 10 million. This amounts to a 37% increase in India's urban population. Cities will generate over 70% of the GDP and 70% of new jobs by 2030, driving a four-fold growth in per capita incomes nationwide. Indian cities are projected to require 700-900 million square meters of new commercial and residential space by 2030, or the size of a new Chicago every year.⁹ Overall, 2.5 million square meters of roads and 7,400 kilometers of metros and subways must be added to India's urban expanses. This is 20 times the capacity that has been added over the last decade.

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According to UN 2/3rd of the population will be urban dwellers by 2050. India needs 500 more cities to accommodate such large scale urbanizing. Keeping this in mind Indian government has proposed to build satellite towns near existing urban areas, upgrade existing mid-sized cities and to build settlements along industrial corridor. Relaxation in FDI norms have also been undertaken to push investments in smart cities.

To complement this rapid and inevitable growth, the government has set an ambitious goal to develop "100 Smart Cities." This plan was supported by a public investment of over \$1.2 billion in the 2014- 2015 fiscal year, with additional funding from private investors.¹⁰ Several top technology companies including Cisco and IBM are already working alongside the government to upgrade India's technology systems. Not surprisingly, the government's report on Smart Cities asserts, **"to accommodate this massive urbanization, India needs to find smarter ways to manage complexities, reduce expenses, increase efficiency and improve the quality of life."**

In the budget speech of July 2014, the Finance Minister has stated as follows: **"As the fruits of development reach an increasingly large number of people, the pace of migration from the rural areas to the cities is increasing. A neo middle class is emerging which has the aspiration of better living standards. Unless, new cities are developed to accommodate the burgeoning number of people, the existing cities would soon become unlivable. The Prime Minister has a vision of developing 'One Hundred Smart Cities', as satellite towns of larger cities and by modernizing the existing mid-sized cities."**

CONCEPTUALIZING SMART CITY

As the concept of a smart city is still emerging and not very old and hence has a lesser clarity. There is a need to conceptualize it, as this concept is used round the globe with different nomenclature, context and meanings. Some use intelligent cities, some say future cities and even digital city, but the basic concept lying behind is to provide a better living environment for the citizens with the ease of life. Several working definitions have been put forward in both practical and academic use. A city well performing in a forward-looking way in economy, people, governance, mobility, environment, and living, built on the smart combination of endowments and activities of self-decisive, independent and aware citizens (Rudolf Giffinger's, 2007). A city that monitors and integrates conditions of all of its critical infrastructures, including roads, bridges, tunnels, rails, subways, airports, seaports, communications, water, power, even major buildings, can better optimize its resources, plan its preventive maintenance activities, and monitor security aspects while maximizing services to its citizens (R.E. Hall, 2000).

A city "connecting the physical infrastructure, the IT infrastructure, the social infrastructure, and the business infrastructure to leverage the collective intelligence of the city" (C. Harrison, 2010). "The use of Smart Computing technologies to make the critical infrastructure components and services of a city—which include city administration, education, healthcare, public safety, real estate, transportation, and utilities—more intelligent, interconnected, and efficient" (Doug Washburn, 2010)

A city "combining ICT and Web 2.0 technology with other organizational, design and planning efforts to dematerialize and speed up bureaucratic processes and help to identify new, innovative solutions to city management complexity, in order to improve sustainability and livability."(Toppeta, 2010) With these much variations in the definition the concepts seems to me moving around ITC, better living environment and smart utilities. Given the conceptual comprehensiveness of a smart city, it could be thought of as a large organic system connecting many subsystems and components.

Dirks and Keeling consider a smart city as the organic integration of systems. The interrelationship between a smart city's core systems is taken into account to make the system of systems smarter. No system operates in isolation. It can be achieved through the integration of the six core principles of smarter cities namely smart people, smart governance, smart environment, smart economy, smart mobility and smart living (Deakin, 2010). The concept of smart city brings about reforms of urban development goals, urban space structure, management mode, etc. While the most notably effect on urban planning is the innovation of planning type and the improvement of urban planning system. The innovation of planning type is bound to brings about series of new related specialized planning types, such as 'smart city development strategic Planning', 'smart city development overall planning', 'pilot smart city construction planning' etc. (Yanlin Zhou 2010)

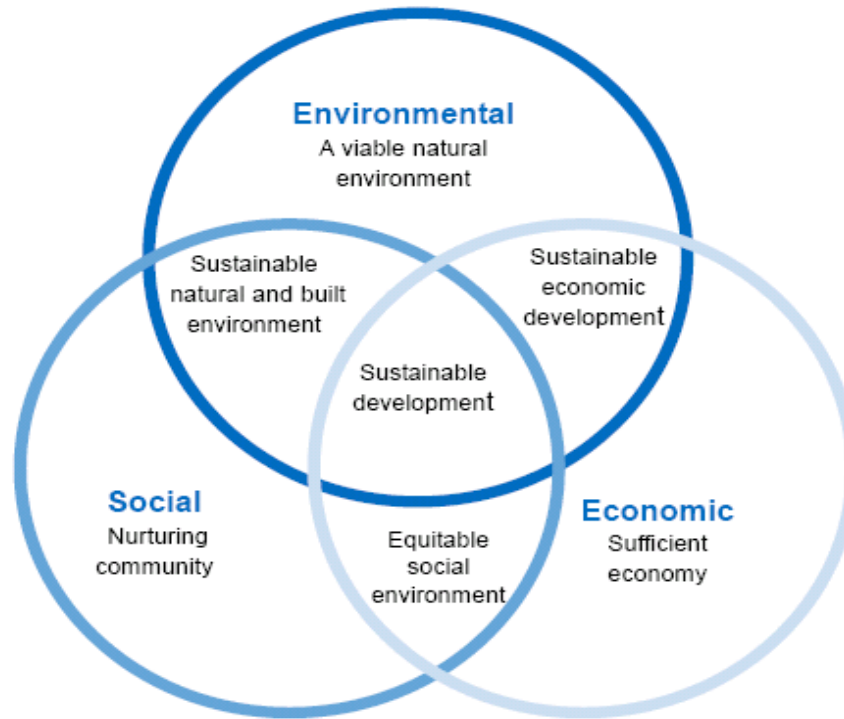
Smart Cities are those which have smart (intelligent) physical, social, institutional and economic infrastructure. It is expected that such a Smart City will generate options for a common man to pursue his/her livelihood and interests meaningfully. In this context:

1. **Competitiveness** refers to a city's ability to create employment opportunities, attract investments and people. The ease of being able to do business and the quality of life it offers determines its competitiveness.
2. **Sustainability** includes social sustainability, environmental sustainability and financial sustainability.
3. **Quality of Life** includes safety and security, inclusiveness, entertainment, ease of seeking and obtaining public services, cost efficient healthcare, quality education, and opportunities for participation in governance.



SMART CITIES: - LIVABLE, WORKABLE AND SUSTAINABLE CITY

An urban region highly advanced in Infrastructure, sustainable real estate, communications and market viability. Information and Communication technology is the principle infrastructure in a smart city which is used to benefit state (govt.), non-state actors (business, citizens, NGO's) and environment. In India they are basically industry backed outfits especially for neo middle class .It is an urban space which is ecologically friendly, technologically integrated and meticulously planned with reliance on IT to improve efficiency.



WHAT MAKES A CITY SMART?

They not only address common city problems like congestion and wasted energy but also help to stimulate the much needed economic growth and job creation. It also empowers citizens with right tools to connect to the right information through data aggregated from various sources like electronic sensors, general statistics, social networks etc. It helps its people to become informed citizens and take part in policy making and service developments in their surroundings. Furthermore it has no barriers between sectors like energy, transport, ICT, water, waste management and healthcare, as integration of these sectors delivers better living experience to the people.

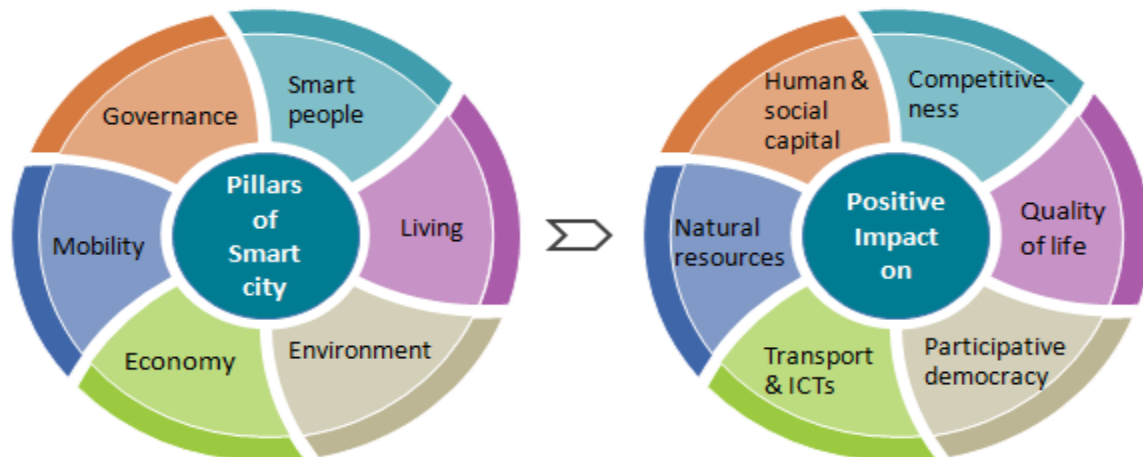
GIFFINGER'S MODEL

To meet the requirement of Smart Cities, **Giffinger's model** defines six core principles in Indian context viz:

- ❖ Smart people.
- ❖ Smart governance.
- ❖ Smart environment.
- ❖ Smart economy.
- ❖ Smart mobility.
- ❖ Smart living.

WHY SMART CITIES?

Urbanisation is increasing at a rapid pace in India. Currently 60% of India lives in rural areas and this figure is expected to change to 50% by 2020. That means Indian cities will need to create housing for nearly 120mn people coming into its cities in the next 6 years.



This is causing unprecedented stress on its energy resources. Our dependence on depleting and polluting sources to meet our current energy demands is dangerously high. It is therefore paramount to resort to alternative sustainable methods. Sustainable development can improve efficiency and reduce this dependence by 40% in energy and 30% in water. Intelligent waste management techniques can reduce waste generation by as much as 70%. A smart city is the only way forward.

CHANGING FACES OF ESSENTIAL SERVICES IN SMART CITIES:-

In India, the urban population is currently 31% of the total population and it contributes over 60% of India's GDP. Cities are referred to as the engines of economic growth. The smart cities of India will be built near Delhi Mumbai industrial corridor, Amritsar Kolkata plan and Chennai Bangalore industrial corridor. The key features of a Smart City is in the intersect between Competitiveness, Capital and Sustainability. Below are the ways in which the essential services will be provided.

SMART GOVERNANCE:-

Smart cities are those where the quality of governance is enhanced with the integration of applications and data centers through the use of IT and communications. This brings government organizations closer to the public by using technology such as e-services, social media, applications and other platforms. It is about improved governance and transforming the ways that public services are delivered.

SMART GRID ENERGY:-

India operates the 3rd largest transmission and distribution electricity network in the world, yet faces a number of challenges including, inadequate access to electricity, supply shortfalls, huge losses, reliability and theft. The evolution towards smart grid will address these issues and transform the existing network into a more efficient, safe and reliable grid that would provide electricity access to all. Implementation of smart meters will allow utility companies to collect and analyze data from every meter, to ensure accurate billing. It is estimated that India will install 130 million smart meters by 2021.

SMART ENVIRONMENT:-

Power Sector: Renewable Energy:-

India's installed electricity generation capacity at, 250 GW, is the world's fifth-largest, with power generation from coal, natural gas, hydro, oil, nuclear, solar, wind, bio-gas, etc. India is mainly dependent on coal to produce electricity, which is also the main source of greenhouse gases, causing global warming. Therefore, the need to focus on more efficient use of coal or alternate fuels and renewable energy. The potential for renewable energy in India is estimated at 249.18 GW (Source: Novonous Research), and the installed capacity is 31.69 GW as on 31 July 2014. (Source: Central Electricity Authority)

Water / Waste water / Sanitation:-

To curb the menace of untreated sewage discharge into water bodies which degrade water quality and cause spreading of water borne diseases in India, Smart cities will provide efficient solutions to improve quality of living with high standard of sanitary facilities and pollution control mechanisms. To overcome water supply, waste water and sanitation issues, cities seek to incorporate the latest technologies, products, solutions, systems, etc., and efforts are on to collate data to diagnose problems, and to prioritize and manage maintenance issues.

Solid Waste:-

There is a focus on solutions to reduce waste and environmental pollution, including to generate energy, and to free up land that would otherwise be used for landfill.

SMART TRANSPORTATION:-

Urban transportation is an important element for smart cities. Hence, the need to review city transportation systems in India (including metros, BRT's, monorail, trams, waterways, walkways, bicycle tracks, etc.), to provide new and enhanced infrastructure for public transportation. EVs / HEVs, with infrastructure for recharging electric vehicles, and battery storage are expected to play a role in improving the quality of life in Indian cities.

Fiscal incentives could encourage faster development in cities. To encourage the use of EV's, the government has launched a National Mission on Electric Mobility, with a target of 6 million electric vehicles by 2020. Electric vehicle charging stations in urban areas and along state and national highways are to be introduced by 2027. The use of bio-fuels is being encouraged with an ethanol-blending program (ethanol with petrol) to curb India's oil imports.

The interstate railway networks on existing routes are to be improved; and high speed rail facilities will be introduced on important routes.

SMART IT AND COMMUNICATIONS:-

To implement Smart IT and communications, policymakers must develop a strong wired and wireless broadband network, and ensure its availability throughout the city to all its residents. Smart cities will use IT to improve the quality of life of its citizens by providing citizen services over communication network.

SMART HEALTH:-

Mobile phones and smart devices will have a large role to play in improving access to healthcare and involving patients more in their own treatment and mobilizing healthcare: harnessing science, technology and entrepreneurship.

SMART EDUCATION:-

Use of ICT in field of education to overcome shortfalls in infrastructure, teaching techniques and evaluation by providing an interactive platform to all the stakeholders (parents, teachers, students and the organization itself)

SMART BUILDINGS:-

The government of India needs to develop 110 million housing units to achieve the vision of "**housing for all by 2022**", in which PPP has an important role to play. Buildings in India consume around 40 percent of total energy generated, and 20 per cent of water and generate 40 percent of the carbon emissions, 30 per cent of solid waste and 20 per cent of water effluents (Centre for Science and Environment). It is estimated that India can save around US\$ 42 billion every year with efficient management of lighting, heating, air-conditioning, etc. Smart building technologies reduce maintenance costs by 10-30 percent, and enhance occupant's comfort, health and safety.

THE IMPORTANCE OF SMART CITIES IN INDIA

India's is urbanizing at an unprecedented rate, so much that estimates suggest nearly 600 million of Indians will be living in cities by 2030, up from 290 million as reported in the 2001 census. With about 30 village dwellers moving every minute from villages to become city dwellers, not many villages will be left India at the end of this century.

Today's cities face significant challenges – increasing populations, environmental and regulatory requirements, declining tax bases and budgets and increased costs. Moreover, the cost of Information and Communication Technologies has plunged making it economical for the government to implement them. Citizens are increasingly getting instant, anywhere, anytime, personalized access to information and services via mobile devices and computers. And they increasingly expect that same kind of access to city services.

City class		Population (000)	Cities (number)			Urban population per class (%)		
Census	HPEC		2001	2011	2031	2001	2015	2031
Class I	Class IA	> 5000	6	8	87	21	23	21
	Class IB	1000–5000	29	45		17	20	21
	Class IC	100–1000	359	412	8413	31	28	29
Class II	Class II	50–100	404	7523		10	9	9
Class III	Class III	20–50	1163			12	11	11
Class IV	Class IV+	10–20	1346			9	8	9
Class V		5–10	879					
Class VI		< 5	192					

With increasing urbanization and the load on rural land, the government has now realized the need for cities that can cope with the challenges of urban living and also be magnets for investment. The announcement of '100 smart cities' falls in line with this vision.

Alongside the hordes of Indians go the jobs and the money as well: a McKinsey Global Institute study estimated that cities would generate 70% of the new jobs created by 2030, produce more than 70% of the Indian gross domestic product and drive a fourfold increase in per capita incomes across the country.

PROGRESS SO FAR:-

The cities with ongoing or proposed smart cities include Kochi in Kerala, Ahmadabad in Gujarat, Aurangabad in Maharashtra, Manesar in Delhi NCR, Khushkera in Rajasthan, Krishnapatnam in Andhra Pradesh, Ponneri in Tamil Nadu and Tumkur in Karnataka. Many of these cities will include special investment regions or special economic zones with modified regulations and tax structures to make it attractive for foreign investment. This is essential because much of the funding for these projects will have to come from private developers and from abroad.

Gujarat International Finance Tec-City (GIFT), Ahmadabad, to be developed over 900 acres, is billed to be one of the country's first smart cities. It will feature remote management of utilities from a single command center, use of data analytics and real-time monitoring of services. It will provide high-quality infrastructure to woo finance and technology firms from places such as Mumbai, Bangalore and Gurgaon. It will have a special economic zone, an international education zone, integrated townships, an entertainment zone, hotels, a convention center, an international techno park, Software Technology Parks of India units, shopping malls, stock exchanges and service units.

Kochi Smart City is another such initiative, albeit over a smaller area of 100 hectares. It has a special economic zone that seeks to replicate Dubai's smart city project.

Naya Raipur is also being built as a smart city. There are also plans to build seven smart cities along the Delhi-Mumbai Industrial Corridor.

CHALLENGES AHEAD

- ❖ All resources and information generated by the city from different sources, systems, and services are distributed in different departments, regions, and their respective information systems. There is no mechanism or model to connect them together, leave alone the perceived need. Until this virtualization is resolved, whatever technology or intelligence applied will be grossly insufficient and inefficient in holistically addressing issues from a city-wide perspective.
- ❖ There is no technical proposal to manage data created across the multiple departments in an integrated way so that the redundant information can be eliminated; the weakness of one kind of information resource can be supplemented by another; and several information resources can be combined together to fulfill tasks more effectively.
- ❖ While the interconnection of different government departments and agencies is not the current focus, the sharing of meaningful data that can improve efficiency and the quality of life—a recurrent theme of a Smart City—of citizens is a challenge that can be explored.
- ❖ Scaling of many newer technologies has not been proven yet.
- ❖ Because ICT is an enabler in Smart City projects, the implementation of the necessary layers related to ICT services (e.g., Communication, Command Centre, and Services/Applications) is usually determined by drivers behind the project and those who initiate it.
- ❖ Although ICT is a key enabler in the development of a Smart City project, the value propositions of most Smart City initiatives do not position ICT as the key to the project's success.
- ❖ Technology challenges; the existing status quo in how cities are run; and technology is not well understood across city sectors as well as by its administrators.
- ❖ Among the main barriers to adopting such solutions is the complexity of how cities are operated, financed, regulated, and planned. City operations are multidimensional and comprise multiple stakeholders whose dependencies and interdependencies affect and ultimately determine the built environment.
- ❖ Rapid urbanization adds pressure to the resource base and increases demand for energy, water, and sanitation, as well as for public services, education, and health care. Consequently, social, economic, and environmental issues have become closely interrelated. But this relatedness remains opaque to officials in charge of particular departments responsible for those services.

CONCLUSION

With more and more people streaming into cities in search of better opportunities for education and employment and urban spaces turning into engines of growth, urbanization is a reality for now and for the foreseeable future.

There is going to be an exponential rise in the urbanization in coming days. Urbanization as we know always creates pressure on urban land and unsustainable use of urban natural resources leading to degradation of environment. Smart City which aims at eco-friendly infrastructure and handles the essential services in ecological way will lead to a sustainable urbanization.

Also on administration side the digital aspect of governance and use of ICT in essential services will provide efficient governance. It also can be said that it will increase the citizen participation in administration. With cautious approach from government and a healthy attitude from citizens Smart Cities can help India usher into a better future.

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