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Review Paper

Facts about the Smart City Mission in India: A Preliminary Review

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Abstract
This paper reviews the concept and practice of Smart City Mission launched by Government of India in 2015 to improve the quality of life of people living in cities and towns across India. The theme of the Mission is smart solution of urban problems and providing the civic needs to people for improving their living styles. At present the mission covers 100 cities and time duration is five years from 2015-16 to 2019-20 to show satisfactory results.. The smart city mission needs appraisal by the parameters like the concept and definition of smartness, components of smart city, types and strategies of smart city and performance evaluation of the first batch of 20 selected / prioritized cities in the first phase. In this context, this paper identifies the following objectives: (i) to review the documents related to smart city initiatives available in the government of India archives, and the research literatures published by scholars, (ii) to explain the concept of the smart city as those exist in developed countries, (iii) to analyze the performance of the identified 100 cities; and (iv) to learn lessons which will be useful for sustainable development any city in order to become 'smart'. For writing this paper only the secondary sources like government documents and research papers were referred to as part of research methodology.

Key Words *- Smart City, Urban Development, City Development Plan*

Introduction

Urbanization is a natural phenomenon around all corners of the world. It is recognized that the cities are engines of economic growth (Gilles Duranton, 2008). India has reached 1.21 billion population mark of whom 31 percent live in cities and towns (Census 2011). The expected population living in urban areas will be 590 million by 2030 who will contribute about 70 percent of Gross Domestic Product (GDP) of the country (McKinsey Global Institute, 2010). In this context, Government of India has launched in June 2015 a *"Smart city project"* to develop 100 cities across India. Only 20 cities namely Bhubaneswar, Pune, Jaipur, Surat, Kochi, Ahmadabad, Jabalpur, Vishakhapatnam, Sholapur, Davanagere, Indore, Delhi, Coimbatore, Kakinada, Belagavi, Udaipur, Guwahati, Chennai, Ludhiana, and Bhopal) have been selected in first stage under Smart City scheme (MoUD, 2015).

Concept and Definition of Smart City

The concept of *Smart City* emerged during the last decade as a fusion of ideas about how information and communication technologies might improve the functioning of cities, enhancing their efficiency, improving their competitiveness, and providing new ways in which problems of poverty, social deprivation, and poor environment might be addressed (Michael Batty et al, 2012). Smart City is defined as investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic development and a high quality of life with a wise management of natural resources through participatory government action (Andrea Caragliu et al 2009***)***. Researchers have defined the *Smart City* differently of which only five are cited in Table 1 below.

Ministry of Urban Development (MoUD) of government of India has clearly used the following terms of smart city: government services, transport, traffic management, energy, health care, water and waste management. Smart city is to ensure effectiveness and efficiency and smartness in the smart living, smart economy, smart governance, smart mobility, and smart environment making the people living in the city smart enough.

Table 1: Definition of a Smart City

Sl. No.	Smart City
1	Smart city is a high-tech intensive and advanced city that connects people, information and city elements using new technologies in order to create a sustainable, greener city, competitive and innovative commerce, and an increased life quality (Bakıcı et al. 2012)
2	Smart cities will take advantage of communications and sensor capabilities sewn into the cities' infrastructures to optimize electrical, transportation, and other logistical operations supporting daily life, thereby improving the quality of life for everyone (Chen, 2010).
3	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. Smart city generally refers to the search and identification of intelligent solutions which allow modern cities to enhance the quality of the services provided to citizens (Giffinger et al. 2007)
4	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 (Hall, 2000).
5	Smart cities are territories with high capacity for learning and innovation, which is built-in the creativity of their population, their institutions of knowledge creation, and their digital infrastructure for communication and knowledge management (Komninos, 2011)

Source: Vito Albino and Rosa Maria Dangelico, 2015

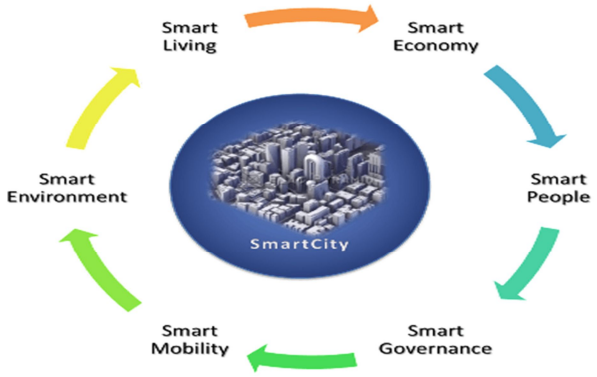

Fig. 1. Smart City Dynamics. *(Source, MUoD, 2015).*

Six components of smart city in India are (1) E-Governance and Citizen Service, (2) Energy Management, (3) Waste Management (Solid Waste Management), (4) Urban Mobility, (5) Waste Management (Wastes of Water Supply System), and (6) Social Aspect facilities. Each component has divided into many sub elements.

The sub elements of E-Governance are Public Information, Grievance Redressal, Electronic Services Delivery, Citizen Engagement, Citizen as City's Eyes and Ears, Video Crime Monitoring. Energy Management sub elements are Smart Meter and Management, Renewal Sources of Energy, Energy Efficient and Green Building. The sub elements of Waste Management Transforming waste to energy and fuel and to compost, waste, treating water, and Recycling and Reduction of C and D Wastes. The sub elements of urban mobility are (i) **S**mart parking, intelligent traffic management, and integrated mutli-modal transport**.** The sub elements of waste management (wastes of water supply system) are: Smart meters and management, Leakage identification, Preventive maintenance, and Water quality monitoring. Lastly, the components of social aspect/other are: Tele-medicine and Tele education, Incubation/trade facilitation centers, and Skill development centers. For a birds eye-view of all the components/elements written above one can see the Table 2 below:

Table 2. Components of Smart City

E-Governance and Citizen Service 1. **Public information, Grievance Redressal** 2. **Electronic Service Delivery** 3. **Citizen Engagement** 4. **Citizen –City's Eyes and Ears** 5. **Video Crime Monitoring**	Energy Management 1. **Smart Meters and Management** 2. **Renewal Sources of Energy** 3. **Energy Efficient & Green Building**
Waste Management – (Solid Waste Management) 1. **Waste to Energy & Fuel**	**Urban Mobility** 1. Smart parking

2. **Waste to Compost**	2. Intelligent Traffic Management
3. **Waste Water to be Treated**	3. Integrated Mutli-Modal Transport
4. **Recycling and Reduction of Cand D Waste**	
Waste Management – (Wastes of Water Supply System)	**Social Aspect/Other**
1. **Smart Meters & Management**	1. Tele-Medicine & Tele Education
2. **Leakage Identification, Preventive Maintenance.**	2. Incubation/Trade Facilitation Centers
3. **Water Quality Monitoring**	3. Skill Development Centers

Source: MoUD, 2015

Monitoring and guide lining the smart city mission in India have been designed to take place at three levels namely; (i) monitoring at national level, (ii) monitoring at state level, and (iii) monitoring at the level of urban local bodies (ULBs). The key members at national level are the Secretary (Housing and Poverty alleviation), Secretary (Expenditure), Joint Secretary (Finance, MoUD), Director (National Institute of Urban Affairs, Delhi), the Chief Town Planner (Town and Country Planning), and Chief Secretaries of States, Chief Executive Officers (CEO) of Special Purpose Vehicles (SPVs), and the Mission Director. The members at state level for monitoring are the Principle Secretary (Finance), Principal Secretary (Planning), Principal Secretary/Director, the Representative of MoUD, selected CEO of SPVs, selected Mayors and Municipal Commissioner, Secretary/Principal Secretary of and Engineers in Urban Development.

City level monitoring members are: the Presidents/ Secretaries, representatives of elected members from all wards, Presidents, Secretaries of slum level federations and of Non-Governmental Agencies (NGOs). (See Fig. 2).

Fig.2: Monitoring Structure for Smart City Mission

The Smart City Mission

For the first time, Smart City Mission is launched by Government of India (GoI) through a comparative method to select 100 cities for transforming those. The main concept of smart city is more on the retrofitting, redevelopment and green field development. The strategic components of retrofitting is targeting in different areas of urban development such as network city, compact city, self-reliant city in the sectors of energy, water, waste and resources use, change in land use and urban form, social values, institutions, economic growth and urban density. The redevelopment component of a city is more focused on the development of physical, social ,economic and environment sectors whereas greenfield development is in the sectors of preservation of watersheds and other natural and cultural resources in a connected open-space system that can make the infrastructure such as utilities, and recreation more land-friendly and cost-effective. On these aspects ,the reader is advised to go through the Table 3 which follows.

Table 3: Smart City Strategy

Sl. No	Smart City Component	Definition	Target in Urban Area
1	Retrofitting	Retrofitting refers to the addition of new technology or features to older systems (Dictionary Fort, 2016)	Smart –Network City, Compact City, Self-Reliant City in the sectors of – Energy, Water, Waste and Resource Use, change in land use and urban form, Social values and institutions, economic growth, Urban Density
2	Re-development	Physical decline makes redevelopment a necessity for cities and reinvestment is needed to reverse declining incomes and the loss of middle-class population (C. Theodore Koebel, 1996).	Physical, Social and Economic and Environment Sectors.
3	Green Field Development	Green infrastructure exemplifies the kind of tool needed to build an initial framework for new development in Greenfield areas—a framework that identifies in advance both ecologically sensitive land and land suitable for development (Jim Heid, 1999)	Preserved watersheds and other natural and cultural resources in a connected open-space system—can also make "hard" infrastructure such as rights-of-way, utilities, and recreation more land-friendly and cost-effective.

Performance of Case Study City in India

The performance of the 41 selected cities in the first round for selecting the smart city projects are in the different level of grade based on the evaluation indicators namely; existing services level, institutional system/capacity, self-financing, past tract records and reforms. The best performing city are Bhubaneswar (B+), Pune (B+) and Jaipur (B+). In the category of grade "B" cities are Surat, Jabalpur, Vishakhapatnam and Sholapur. For the grade "C+" category cities are Davanagere, Indore, Delhi, Coimbatore, Kakinada, Belagavi, Udaipur, Guwahati, Chennai, Ludhiana, Bhobal, Warangal, Chnadigarh, Lucknow, New Town Kolkata, Panaji and Pasighat. For the grade "C" category cities are Dharamshala, Faridabad, Raipur, Bhagalpur, Shillong, Namchi, Port Blair, Diu, Oulgaret, Silvassa, Imphal, Ranchi, Agartala, Kohima, Aizawl and Kavaratti and one city in the category of grade "D" is Dehradun.(See Table 4).

Table 4: First Round Performance of Smart City

Evaluation Indicators	Sate	City	Total Score	Grade
Existing Service Level - **Percentage of increasing over census 2011 or Swachh Bharat Baseline on number of household sanitary latrine (whichever is less) [10 Marks]** **Making operate online Grievance Redressal System with response being sent back to complaint [5 Marks]** **At least first monthly e-newsletter published [5 Marks]** **Electronically place project-wise municipal budget expenditure information for the last two financial years on the web site [5 Marks]** Institutional System/Capacity - **Started to Levy compensatory penalty for delays in services delivery [5 Marks]** **Has the total Collection of internally generated revenue (e.g. taxs, fees, charges) during the last three FYs (2012-2015) [10 Marks]** Self-Financing - **Payment of salary by ULB up to last month [5 Marks]** **Audit of accounts for FY 12-13 [5 Marks]** **Percentage contribution of tax revenue,**	Odisha	Bhubaneswar	78.83	B+
	Maharashtra	Pune	77.42	B+
	Rajasthan	Jaipur	73.83	B+
	Gujarat	Surat	68.16	B
	Madhya Pradesh	Jabalpur	63.03	B
	Andhra Pradesh	Vishakhapatnam	61.12	B
	Maharashtra	Sholapur	60.83	B
	Karnataka	Davanagere	59.93	C+
	Madhya Pradesh	Indore	59.89	C+
	Delhi	Delhi	59.63	C+
	Tamil Nadu	Coimbatore	58.74	C+
	Andhra Pradesh	Kakinada	58.19	C+
	Karnataka	Belagavi	57.99	C+
	Rajasthan	Udaipur	57.91	C+
	Assam	Guwahati	57.66	C+
	Tamil Nadu	Chennai	56.16	C+
	Punjab	Ludhiana	55.84	C+
	Madhya Pradesh	Bhobal	55.47	C+
	Telangana	Warangal	54.79	C+
	Chandigarh	Chandigarh	54.73	C+
	Uttar Pradesh	Lucknow	53.24	C+
	Wes Bengal	New Town Kolkata	53.10	C+
	Goa	Panaji	52.99	C+
	Arunachal Pradesh	Pasighat	52.26	C+
	Himachal Pradesh	Dharamshala	48.10	C
	Haryana	Faridabad	47.86	C

fees and user charges, rents and other internal revenue sources to ULB Budget (actual in 2014-15) [10 Marks]	Chhattisgarh	Raipur	47.60	C
	Bihar	Bhagalpur	47.39	C
	Meghalaya	Shillong	46.65	C
Percentage of establishment and maintenance cost of water supply, which is met by collected user charges for supply of water during last FY (2014-15) [10 Marks]	Sikkim	Namchi	46.27	C
	A&N Island	Port Blair	46.25	C
	Daman & Diu	Diu	46.07	C
	Pondicherry	Oulgaret	46.05	C
Past tract record and reforms -	Dadar & Nagar Haveli	Silvassa	45.70	C
Percentage contribution of internal revenue sources (self-generated) budget funds used for capital works during FY 2014-15 [10 Marks]	Manipur	Imphal	44.27	C
	Jharkhand	Ranchi	44.04	C
	Tripura	Agartala	43.58	C
	Nagaland	Kohima	42.55	C
Percentage of City-level JnNURM reforms achieved [10 Marks]	Mizoram	Aizawl	42.06	C
	Lakshadweep	Kavaratti	41.92	C
Percentage of JnNURM Completed which sanctioned during the original Mission period up to March, 2012 under JnNURM [10 Marks]	Uttrakhand	Dehradun	38.13	D

Source: Based on MoUD, 2015

In the second round performance selected 50 cities in the category of grade "C+" are Ujjain, Gwalior, Amritsar, Shivamogga, Jalandhar, Madurai, Nagpur, Salem, Nashik, Agra, Thane, Rajkot, Kalyan-Dombivali, Vellore, Kanpur, Tirupati, Greater Mumbai, Hubballi-Dhawad, Navi Mumbai, Rourkela, Bidhnanagar, Dahod, Mangaluru and Ajmer. The rest of the cities are in the category of grade "C" (See Table 5).

Table 5: Second Round Performance of Smart City

Evaluation Indicators	Sate	City	Total Score	Grade
Existing Service Level -	Madhya Pradesh	Ujjain	55.03	C+
Percentage of increasing over census 2011 or Swachh Bharat Baseline on number of household sanitary latrine (whichever is less) [10 Marks]	Madhya Pradesh	Gwalior	54.82	C+
	Punjab	Amritsar	54.55	C+
	Karnataka	Shivamoga	54.36	C+
	Punjab	Jalandhar	53.82	C+
Making operate online Grievance Redressal System with response being sent back to complaint [5 Marks]	Tamil Nadu	Madurai	53.34	C+
	Maharashtra	Nagpur	53.00	C+
	Tamil Nadu	Salem	52.95	C+
At least first monthly e-newsletter published [5 Marks]	Maharashtra	Nashik	52.75	C+
	Uttar Pradesh	Agra	52.69	C+
Electronically place project-wise municipal budget expenditure information for the last two financial years on the web site [5 Marks]	Maharashtra	Thane	52.34	C+
	Gujarat	Rajkot	52.33	C+
	Maharashtra	Kalyan-Dombivali	52.30	C+
	Tamil Nadu	Vellore	52.04	C+
Institutional System/Capacity -	Uttar Pradesh	Kanpur	52.00	C+
Started to Levy compensatory penalty for delays in services delivery [5 Marks]	Andhra Pradesh	Tirupati	51.78	C+
	Maharashtra	Greater Mumbai	51.77	C+
Has the total Collection of internally generated revenue (e.g. taxs, fees, charges) during the last three FYs (2012-2015) [10 Marks]	Karnataka	Hubballi-Dhawad	51.71	C+
	Mahrashtra	Navi Mumbai	51.77	C+
	Odisha	Rourkela	51.53	C+
	West Bengal	Bidhnanagar	51.30	C+
Self-Financing -	Gujarat	Dahod	50.92	C+
Payment of salary by ULB up to last month [5 Marks]	Karnataka	Mangaluru	50.79	C+
	Rajasthan	Ajmer	50.56	C+
Audit of accounts for FY 12-13 [5 Marks]	Madhya Pradesh	Satna	48.97	C
Percentage contribution of tax revenue, fees and user charges, rents and other internal revenue sources to ULB Budget (actual in 2014-15) [10 Marks]	Tamil Nadu	Tirunelveli	48.56	C
	Tamil Nadu	Thoothukudi	48.33	C
	Tamil nadu	Erode	48.14	C
	Tamil Nadu	Tiru chirapalli	47.70	C

Percentage of establishment and maintenance cost of water supply, which is met by collected user charges for supply of water during last FY (2014-15) [10 Marks]	Tamil Nadu	Dindigul	47.58	C
	Maharashtra	Amravati	47.57	C
	Haryana	Karnal	47.16	C
	Rajasthan	Kota	47.15	C
	West Bengal	Haldia	47.07	C
Past tract record and reforms -	Tamil Nadu	Thanjavur	47.03	C
Percentage contribution of internal revenue sources (self-generated) budget funds used for capital works during FY 2014-15 [10 Marks]	Gujarat	Gandhinagar	46.27	C
	Tamil Nadu	Tiruppur	46.04	C
	Maharashtra	Aurangabad	45.70	C
	Uttar Pradesh	Allahabad	45.50	C
Percentage of City-level JnNURM reforms achieved [10 Marks]	Chhattisgarh	Bilaspur	45.37	C
	Gujarat	Vadodara	44.53	C
Percentage of JnNURM Completed which sanctioned during the original Mission period up to March, 2012 under JnNURM [10 Marks]	Uttar Pradesh	Jhansi	44.41	C
	Uttar Pradesh	Moradabad	43.39	C
	Uttar Pradesh	Ghaziabad	43.07	C
	Uttar Pradesh	Bareilly	42.68	C
	Uttar Pradesh	Rampur	42.67	C
	Bihar	Biharsharif	42.22	C
	Uttar Pradesh	Saharanpur	42.09	C
	Bihar	Muzaffarpur	42.00	C
	Uttar Pradesh	Varanasi	40.21	C

Source: Based on MoUD, 2015

Conclusion

The smart city is very unique program to develop cities in a sustainable manner in India to ensure the livability, sustainability and economic development. The new concept of the smart city is new in India. However it has been introduced in many developed countries. The philosophy of smart city in India focuses on the retrofitting, redevelopment and green field development. The reforms strategy is to encourage the Urban Local Bodies (ULBs) to build capacity to overcome the projects implementation under smart city components. The overall performance of the selected cities under smart city programme was very poor in terms of Existing Service Level, Institutional System/Capacity, Self Financing, past tract record and Reforms. It is revealed that ULBs are weak to work out effectively and efficiently for smart city projects. Hence, needs arise to carry out the reforms implementation at ULBs level to perform and operate functionally to make themselves *"Smart Cities"*.

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