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Mapping of Sustainable Smart Cities in India: Issues and Challenges

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ABSTRACT

This government programme is good news for the Indian IT industry in general and it especially offers many opportunities in the geo-ICT sector. India does not yet have an authoritative spatial foundation framework. All the government authorities need to organise their infrastructural assets in such a manner that they are 'GIS ready'. It will be challenging to create a single GIS data warehouse of countless sets of available survey data, maps, images, tabular geotagged development data, cadastral data, etc. For instance, although most of the private utility companies operating in cities have their own GIS data warehouse, the same cannot be said for the city-owned utilities. Furthermore the cities have not been surveyed and mapped accurately. While many of them have initiated a city survey for purposes such as property tax, utilities mapping and suchlike, this is usually neither comprehensive nor consolidated. Another important component involves periodically updating the information at predefined intervals. Every department within the city has so far done its own mapping, so there is now a strong need for single-source location data that can be cross-leveraged by multiple departments. There are already some good examples. In New Delhi, for example, SDI has been used effectively for sustainable development and it has received legal support from the Delhi government in the form of the SDI Act. A few cities, like Bangalore, Hyderabad, Delhi and Kanpur, have a very strong property tax management component built on top of a robust GIS database. They have been using this effectively for years now and other cities are now in the process of setting up a similar system. However, the problem is that the GIS applications and data are maintained for a specific problem/service and are not available holistically for the entire city. The biggest challenge each Indian city faces today is the lack of the technical capacity to plan, implement and monitor IT driven or embedded projects. In the creation of this capacity, it is extremely important to understand the lifecycle value of the projects. They should be designed in such a way that they can be evaluated on functional outcomes and not just on cost. The workflow analysis should ensure that there is no duplication of effort and that the evaluations are a shared resource for all the departments involved.

The upsurge in urban population in Indian cities will intensify societal challenges on every conceivable level. To improve the quality of life and attract investment in cities, proactive measures are now essential for government agencies. They will inevitably become increasingly dependent on (geo)ICT in order to develop and manage their assets and infrastructures more efficiently and effectively. This facilitates – and also demands – elimination of 'silos' within city authorities. In 2016, India's government will select 100 municipalities to turn substantial parts of their urbanisations into 'smart cities'. The pace of urbanisation is so high that in 15 years' time more than 600 million Indian citizens will be living in cities (compared with 350 million today). As studies of urban population growth by The World Bank and other agencies show, demand will increase in fundamental humanitarian areas: water, food, energy, infrastructure, sanitation, transport, education, employment and housing. The urban space must be kept liveable and economically sustainable and must therefore undergo a dramatic upgrade in all segments, not least to sustain the growth of the Indian economy. Cities are the powerhouses of economic growth of every nation, and India is no different. Nearly 31% of India's current population live in urban areas and generate 63% of India's GDP (source: Census 2011). In view of increasing urbanisation, urban areas are expected to house 40% of India's population and generate 75% of India's GDP by 2030. This requires comprehensive development of the physical, institutional, social and economic infrastructure. Working towards smart cities is a step in the right direction. Spatial information is the foundation of all planned activities and informed decision-making in knowledge-based and policy driven smart cities – from a city-planning perspective to services offered to the citizens. Therefore, a spatial data infrastructure (SDI) must be the platform for spatial data creation, exchange and use.

Keywords: GIS Mapping, GDP, Smart Cities, SDI, World Bank, Delhi/ NCR, ICT Application.

I. INTRODUCTION

Urban areas are getting more and more congested due to people's migration, natural population growth, environmental changes, and local and national policies. At the same time, rapid urbanization puts pressure on resources, increasing demand for energy, water, and sanitation, as well as for public services, education and health care. Cities are therefore referred to as the engines of economic growth. There is accordingly a desperate need for the cities to get smarter to handle this large-scale urbanization and to find new ways to manage complexity, increase efficiency, reduce cost, and improve quality of life.

In the last 50 years, world population has grown exponentially at an average rate of 1.2% per year and more people are moving to cities every day. As the global population continues to grow at a steady pace, more and more people are moving to cities every single day. In 2007, for the first time in the history of mankind, the number of people living in cities surpassed the number living in rural areas and it is estimated that the proportion will exceed 70% by 2050. Given the socioeconomic development, urbanization provides better job opportunities for millions of people around the world. During 1950-2010, a net 1.3 billion people were added in small cities, more than double the number of people added in medium cities (632 million) or large cities (570 million). As per UN World Economic and Social Survey 2013, 80% of the world's urban population will live in developing regions, especially in cities of Africa and Asia. In India, the urban population is currently 31% of the total population and it contributes over 60% of India's GDP.

It is projected that urban India will contribute nearly 75% of the national GDP in the next 15 years. Cities are accordingly referred to as the engines of economic growth. It is pertinent to note that several forward looking nations have embarked upon their own standardization initiatives, national or regional strategy, and commercial solutions on Smart Cities or its revolving areas. This includes the European Union, United Kingdom, United States of America, China, Korea and Germany. Such an effort is critical for India considering its diverse and unique needs, and the opportunities it demands in its approach towards Smart Cities. While, ITU defines a Smart Sustainable City as "A smart sustainable city is an innovative city that uses information and communication technologies (ICTs) and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social and environmental aspects".

II. SMART CITIES IN INDIA

Lavasa in Maharashtra: It is India's first e-city., My City Technology -- a joint venture set-up by Lavasa Corporation and Wipro would help in city management services, e-governance, ICT infrastructure and value added services, including proposing and implementing intelligent home solutions and digital lifestyles for the Lavasa citizens. Lavasa homes will offer touch-point automation, occupancy based lighting, door and motion sensors, beam detectors and on-call transport services.

GIFT City in Gujarat: GIFT city coming up in Gandhi Nagar, Gujarat, will have a central command centre to monitor the city-wide IT network and respond quickly during emergencies, energy-efficient cooling systems instead of air conditioning, and high-tech waste collection systems. Cars will remain outside, and there will be moving walkways to get to the city centre.

Greater Hyderabad: It is using GPS and GPRS technologies to cover solid waste management, and maintain parks and street lights through cell phone images, subsequently put in the public domain.

Surat: Has on-line water quality monitoring system.

Coimbatore: Has computerized building-plan approval scheme.

Bangalore: Has opting for geographic information systems (GIS) to standardize property tax administration.

Jamshedpur: Has Utilities Company providing an IT-enabled 24/7 single-window call centre and customer database.

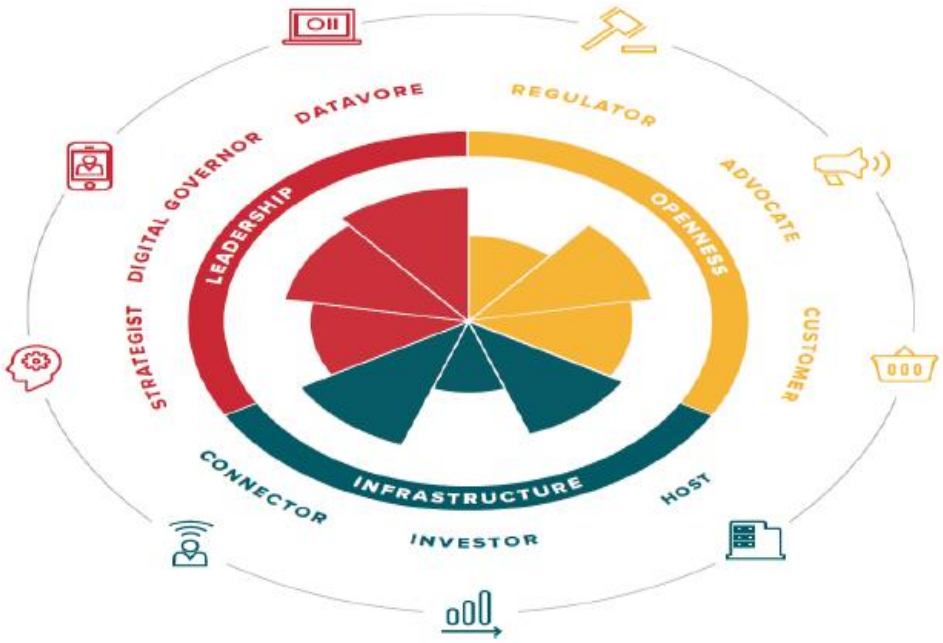
Kanpur: Has improving municipal revenues using a GIS-linked property database.

III. PRE- REQUISITES OF SMART CITY IN INDIA:

Spatial Planning is one of the important pre-requisites for smart city in Indian context and should consider the following crucial aspects:

- Preparation of comprehensive city spatial plans using 'State of art' technologies such as GIS and Remote Sensing applications.

- Spatial Plan which envisages efficient allocation of land and resources.
- Poly-centric city plan with mixed land use.
- Integration of land use and transportation using TOD concept.
- Local area planning and energy efficient urban design involving citizens/stakeholders.
- Sustainable Urban Transport road design to bring about more equitable allocation of road space for movement of people, rather than only vehicles by providing compact, well-designed and well coordinated pedestrian and Non Motorized Transport oriented infrastructure.
- Revisiting existing development controls and zoning regulations.
- Infrastructure Planning & resource mobilization.
- Capacity building, skill development training and exposure visit for city planners to familiarize with latest techniques and technologies.



OPENNESS	INFRASTRUCTURE	LEADERSHIP
How open is the city to new ideas and businesses?	*How does the city optimise its infrastructure for high-growth new businesses?*	*How does the city build innovation into its own activities?*
REGULATOR *How does the city regulate business models in a way that allows for disruptive entry?*	**HOST** *How does the city use space to create opportunities for high-growth companies?*	**STRATEGIST** *Has the city set a clear direction and built the internal capability required to support innovation?*
ADVOCATE *How does the city promote itself as an innovative hub and its new business community to the outside world?*	**INVESTOR** *How does the city invest in the skills and businesses required for innovation?*	**DIGITAL GOVERNOR** *How does the city use digital channels to foster high-quality, low-friction engagement with citizens?*
CUSTOMER *Is procurement accessible to small businesses, and does it actively seek out innovation?*	**CONNECTOR** *How does the city facilitate physical and digital connectivity?*	**DATAVORE** *How does the city use data to optimise services and provide the raw material for innovation?*

IV. NATIONAL URBAN INFORMATION SYSTEM SCHEME (NUIS):

The Planning Commission recommended that all components related to spatial and attribute data be integrated in one scheme called the National Urban Information Scheme. The National Information System Scheme (NUIS) of the Ministry can be seen as a very initial step towards achieving smart cities. The Scheme enables mapping of the city and its surroundings and core areas with a number of add on layers and related attribute data. Based on this, a number of applications and models may be generated to assess the impact of Schemes in relation to parameters such as housing and transport pattern, access to educational and commercial facilities, parks and playgrounds and other amenities. The National Urban Information System Scheme (NUIS) comprises of broadly two major components with independent but related objectives, strategies and budget under a single umbrella i.e.

- Urban Spatial Information System Scheme (USIS): Seamless integration of databases in two scales: 1:10 000 & 1:2000 and Utility mapping at 1:1000 Scale.
- National Urban Databank and Indicators: Attribute Data on periodic basis.

Sub- Components of USIS:

- Systems (HW/SW)
- Base Map and GIS Data Base 1:10,000 Scale & 1:2000 Scale
- Utility Mapping 1:1000 Scale
- Capacity Building
- Application Development

NUIS APPLICATION:

- Master/Development/Zonal Plan
- Land and Natural Resources
- Settlement Pattern
- Study of Slums and Blighted Areas
- Improvement of Urban Environment
- Redevelopment/Re-densification of Towns/Cities
- Land Monitoring
- Monitoring of Land Regulation and Urban Fringe
- Transport Planning and Environmental Assessment and Safety

V. GIS MAPPING CHALLENGES:

A city has many physical functions which are manifested in the different forms of infrastructure – water, waste, buildings and so on. Each infrastructure element is a system and is made up of sub-systems, components and devices which behave like a communications data network by communicating between themselves. The city is made up of these different infrastructure verticals forming a "system of systems". There is a clear nexus between these different systems, for example a building uses energy, water and generates waste and if the different individual smart systems come together, the building becomes "smart". However, in many cases these city infrastructure elements typically tend to operate in silos. Smart Cities needs an integrated treatment of all smart infrastructures. Smarter ways to develop cities will emerge when city governments and citizens start thinking and planning for infrastructure components in a holistic manner.
ICT can facilitate this process. One commonly used approach is to aggregate the different data streams in the city under a single roof. This enables the collection and integration of data from different individual domain systems across functions – creating system wide efficiencies and allowing for new insights. These operations centers act as the "nerve center" for the different smart initiatives by providing the technology foundation needed for an integrated view (more of this is discussed in the next chapter including case study from Centro de Operações Preifetura do Rio de Janeiro (COR), Brazil).

An example of such an integrated approach is explained in the case study below through the GIFT City in India, where multiple utilities are provided through a single tunnel, resulting in huge cost savings and better management of urban space. Hence, co-locating different infrastructure components is one way to achieve integrated development of a smart city. Another example of this colocation is when infrastructure components perform multiple roles which cut across conventional infrastructural domains. For instance, in some smart city projects, the smart street lighting systems also act as environmental pollution monitors, constantly recording and relaying the environmental performance data as well as security cameras ensuring safety. Integrating the data collected through one infrastructure component and using the same in an effective manner in the operation or maintenance of another infrastructure provides another key method of

integrating infrastructure operations in smart cities. This is exemplified in the case study from Eindhoven, Netherlands in the box below. The data generated form the smart traffic management system was used to predict and identify road maintenance works. Finding such 'smarter' integrated approaches to infrastructure.

Data is an important component of Smart Cities. The sensor networks, intelligent meters, mobile phones and IoT devices all generate huge volumes of data. This generated data could be transformed by city government to generate new insights that could be monetized and sold to different stakeholders. The key would be to generate a suitable value chain for the data and an appropriate business model for the same at different layers. One example in this regard is that the information collected from automated meters could be used by government to generate insights from the aggregated data and market the same to interested third parties without compromising the privacy of individuals. In addition, big data and analytics can enable an increase of tax collection by reducing tax evasion, and this increase in revenue can be leveraged for smart infrastructure investments. However, it needs to be ensured that during the process of monetizing of data, privacy and security of all citizens are preserved.

STI-led smart city applications can lead to more efficient use of existing public resources and generate additional financing options through such routes. An interesting success story of this is from Kirklees, United Kingdom, which was one of the winners of the 2014 Mayors Challenge in the United Kingdom. Kirklees stimulates and operates a new sharing economy to maximize untapped local resources and do more with less. The city pooled idle government assets – from vehicles, to venues, and citizens' skills and expertise – and work with non-profit sectors to make these assets available through an online platform that would organize and allow for borrowing, bartering, and time-banking to benefit both programs and residents113. Such smart concepts can facilitate more efficient use of existing resources and provide new sources of revenue for cities. Electronic tax payment systems at the City level are another way to boost revenue generation. For instance, Kampala (Uganda) introduced the electronic tax payment system called 'e-Citie', which allows clients to use their mobile phones to pay fees ranging from yellow fever, commuter taxi monthly revenue and property rates among others. This has led to a doubling of tax revenue collection.

CONCLUSION:

A Framework helps capture the various ICT enabled cross-city governance processes that deliver benefits based on core guiding principles, taking due account of critical success factors. Standardisation and interoperability are key requirements for the widespread adoption of technologies and services to provide services at the city level. Cities will need to be able to better integrate wireless networks, data centres and other infrastructural elements, making provision seamless and transparent. Cities will increasingly move from being service providers to platform ones, providing an infrastructure that enables the development of a broad range of public and private applications and services. Standardised technologies and infrastructures is a prerequisite for the development of Smart Cities. Instead of replicating infrastructure for every city in a state, ideally it makes sense that the different Smart Cities in State leverage the State level Infrastructure. This will enable:

- Effectiveness of delivery through integration with other services.
- Efficiency through dynamic workload migration and sharing of resources
- More optimal service Quality & Cost Considerations

REFERENCES

[1]. "ROLE OF GIS IN SMART CITIES" by K.K. Joadder, Chief Town Planner, Ministry of Urban Development, Govt. Of India.
[2]. Pathways to a Sustainable Transportation Plan by Heather Farley, Sustainability Coordinator NAU – Flagstaff
[3]. https://www.india.gov.in/spotlight/smart-cities-mission-step-towards-smart-india
[4]. https://scroll.in › India › Urban Development
[5]. www.pwc.in/assets/pdfs/publications/2015/making-cities-smart-and-sustainable.pdf
[6]. Smart City Mission: Ministry of Housing and Urban Affairs, Govt of India
[7]. HUDCO Website
[8]. "Reserving well being and economic growth in India" and "Leapfrogging Urban Problems with Smart Cities"