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Let noble thoughts come to us from all sides
Rig Veda

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Towards Smarter India

In recent years, the question of how we can live a “smart” life has become the focus of everybody’s imagination. Growing population and rapid urbanization have forced large scale migration of people from rural to urban areas. This has resulted in heavy strain on energy, transportation, water, building and public spaces. Policy makers are trying hard to find ways and means to address these issues. Increasing need is being felt for “smart” city solutions which are both efficient and sustainable on one hand and can generate economic prosperity and social well-being on the other.

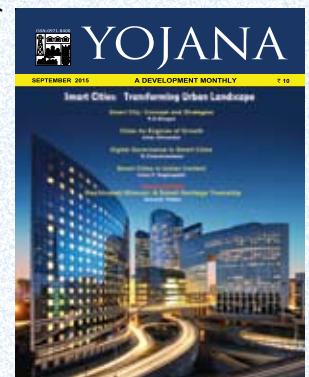
Indian economy has been growing consistently attracting global acclaim. Analysts point out that along with liberalization and new generation reforms, systematic planning and inherent strength of Indian economy has paved the way for such a growth story. At the same time, marching forward ensuring inclusive growth is no easy task. Growing economic activity and urbanization have historically gone hand in hand. Fast pace of economic activities in cities has led to large scale migration from rural areas to urban centers in search of better employment and living. Many of our cities are struggling to cope up with the adverse effects of unplanned development without any master plans. Adequate infrastructure and avenues for IT enabled services are sadly in short supply in most cities. Fast increasing gulf between urban rich and poor is also a matter of serious concern.

It is true that the agrarian sector is the backbone of Indian economy. However, at present, two third of our Gross Domestic Product (GDP) is generated from the urban sector. The fact that cities drive India’s economic growth, underlines the need for state-of-art infrastructure facilities and service delivery mechanism in our cities. The Smart City Mission focuses on provision of core infrastructure services like adequate supply of clean water, sanitation, solid waste management, efficient urban mobility and public transportation, robust IT connectivity, affordable housing for the poor among other things. This ambitious programme of the Government to create 100 smart cities across the country is centered around the aim of ensuring smart and sustainable development based on inclusive growth. The Mission will cover 100 cities within five years from 2015-16 to 2019-2020. Inclusive in nature, such smart cities using latest IT tools for all-round development, will create further job opportunities for the urban poor and less privileged sections.

Another ambitious programme, the Atal Mission for Rejuvenation and Urban Transformation (AMRUT), will be complementary to the Smart Cities Mission. The total outlays for Smart Cities Mission and AMRUT comes to a whopping Rs. 48,000 crore and Rs. 50,000 crore respectively.

Yet another programme, the **Pradhan Mantri Awas Yojana (PMAY)** will see the Government spend about Rs 3 lakh crore in the next seven years to construct 2 crore affordable houses in urban areas for slum dwellers and people from economically-weaker sections and low income groups. This will be a boon to millions of slum dwellers and urban poor struggling to face the hard realities of survival.

Aiming to provide state-of-the-art infrastructure facility and efficient service system using information and digital technologies, the Smart Cities Mission will provide the right fillip in bridging the social and economic divide. At the same time, instead of replicating Smart Cities of other nations, India needs to formulate its own strategies suitable to its own requirements. In implementing Smart Cities Project, India’s upper hand in technology, especially IT sector and availability of skilled manpower in abundance are some of the advantages. With correct approach of its people, effective governance and doing away with corruption, India can hope to enter an era of smart life and create a smarter world for its citizens. □



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Smart City: Concept and Strategies

R B Bhagat



The emergence of the idea of the smart city ought to be seen in the backdrop of the need to contain corruption and meet the requirement of adequate and efficient service delivery in urban areas using information and digital technologies. The success of the programmes will be judged in future by its power to transform the life of the people, and their ability to reduce growing inequality in our society

Human civilisation has been carried forward by the cities that have been seats of power, culture, trade and centres of production.

Historians consider the Indus Valley civilisation as an urban civilisation. In later periods, there were many great urban centres in India namely Patliputra (Patna), Vaishali, Kaushambi, and Ujjain in ancient times and Agra and Shahjahanabad (Delhi) during the medieval times just to mention a few. The list is very exhaustive so far India's urban civilisation is concerned (Ramachandran 1995; Sharma 2005; Champakalakshmi 2006).

In order to understand the emergence of the concept of smart cities, it is necessary to understand the nature of cities. Cities are large densely populated areas with heterogeneous population both in terms of occupational and skill diversity and also ethnic and social composition. In fact, heterogeneity and diversity are the hallmark of cities historically established promoting innovations but throwing challenges for inclusiveness, fairness and justice. Also, cities do not exist in isolation but are connected with each other as a part of the urban hierarchy forming an urban system. The lower level of urban hierarchy (small cities and

towns) is more intensively related with rural areas, while rural to urban migration influences almost all the levels of urban hierarchy right from megacity to the small towns. Looked at from this perspective, cities are not only the seats of economic growth, but also a vehicle for distributing the fruits of development in the entire range of settlement hierarchy including both urban and rural segments. Further, cities are also entities of intense flows not only confined to the limits of cities but also across the entire spectrum of cities and towns. They are interconnected with each other with varied levels of flows of information, capital, movement of goods and services and labour migration. As many cities have been harbingers of economic progress and social change in the past, they have been smart in their respective epoch of human history. However, the present nuances of the smart city ought to be seen in the contemporary context of the forces of globalisation and the huge expansion of information technology shaping our cities and influencing our lives.

The paradigm of smart cities appeared in the late 1980s as a means to visualize urban context, and since then they evolved fast in different contexts (Anthopoulos and Vakali 2012). According to Townsend (2014), 'smart cities are places where

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information technology is welded to address problems old and new. The old city of concrete, glass and steel now conceals a vast underworld of computer and softwares. The new city, on the other hand, is a digital upgrade to our built legacy giving rise to a new wind of city'- we may call it a smart city. There is also a perspective that tries to look at the smart city, not as a whole but part of it. For example, it is argued that whatever smart city may mean, not all spaces of the city will be equally smart. It means that some places, people, and activities will have privileges over others (Shelton, Zook and Wiig 2015). A global IT company IBM thinks that 'in the 21st century, cities compete globally to attract both citizens and businesses. A city's attractiveness is directly related to its ability to offer the basic services that support growth opportunities, build economic value and create competitive differentiation. Potential inhabitants, of both the commercial and residential variety, are a discriminating lot, and they are looking for cities that operate efficiently and purposefully. They are looking for smarter cities' (IBM 2012).

There is no definite definition of a smart city, but the basic question is what we want a smart city to be (Angelidou 2014; Townsend 2014). We may define smart cities as those where smart people live. There are two ways of defining smart people. One who is intelligent and prosperous, but individualistic, consumerist and confined to himself, while other is active in reaching out, contributing and transforming the life of the underclass. In a similar vein, the smart city is not an isolated enclave or a gated city but a city that connects with its people and transforms their life. Thus, it would be pertinent to mention that while cities transform people, people make cities. We need to be clear about how we use the technology to shape our cities and its consequences for the poor and the people at the margins (Albino et al, 2015). Further, as India has been rapidly urbanising, the fortunes of people hugely depend upon how we build our cities. At the same time intervention by the government

could be helpful in envisioning and shaping our cities. The policies and programmes of Central Government during the last one decade should be seen in this light.

Smart Cities Mission

In 2005, JNNURM (Jawaharlal Nehru National Urban Renewal Mission) was started which was redesigned as programmes like the Smart City and AMRUT (Atal Mission for Rejuvenation and Urban Transformation) a decade later in 2015. The JNNURM was significantly different from the earlier urban policy and programmes because it recognised the importance of cities in India's economic growth in the light of the emerging fact that about two-third of GDP accrued from urban areas

The old city of concrete, glass and steel now conceals a vast underworld of computer and softwares. The new city, on the other hand, is a digital upgrade to our built legacy giving rise to a new wind of city'- we may call it a smart city.

(Bhagat 2011). The recent urban development strategies like the Smart Cities Mission and AMRUT reflect the continuity as well as deepening of the city development strategies initiated under JNNURM. Many criticised JNNURM for being exclusionary given a huge socio-economic inequality within the cities as well as between the regions. Inclusiveness has been a challenge for any urban development programmes along with growth and sustainability.

The Smart Cities Mission will cover 100 cities during the five year period from 2015-16 to 2019-2020. It may be extended depending upon the evaluation by the Ministry of Urban Development. So, the concept and strategies of the smart city will continue to be an evolving one. The Mission did not provide any definition of the smart city but aims to harness the potential of the city which aspires to become smart through smart

solutions. Smart solutions include e-governance and electronic service delivery, video crime monitoring, smart meters for water supply management, smart parking and intelligent traffic management to mention few from a long list. Application of smart solutions will enable cities to use technology, information and data to improve infrastructure and services. It will also endeavour area based development through retrofitting (city improvement) and redevelopment (city renewal). In addition, new areas/greenfield (city extension) will be developed around the city to accommodate growing urban population. It is envisaged that the strategies for the development of a smart city will create enough jobs and take care of the poor. Thus, it is conceived that the smart cities would be inclusive.

The implementation of the Smart Cities Mission will be carried out by a Special Purpose Vehicle (SPV) headed by a full-time CEO with nominees of Central, State and Local Governments. The SPV will be a limited company under the Companies Act, 2013 at the city-level. At the city level, a Smart City Advisory Forum will be established for all 100 Smart Cities to advise and enable collaboration among various stakeholders and will include the District Collector, MP, MLA, Mayor, CEO of SPV, local youths and citizens and technical experts. The Smart Cities Mission requires smart people to participate actively in governance and reforms. The participation of smart people will be enabled by the SPV through increasing use of ICT, especially mobile-based tools. The Central Government will provide Rs 194 crore as grant initially with an equal matching grant from the state government. The future grants to the smart city depend upon performance. The 100 smart cities will be selected based on competition inviting Smart City Proposal. A large number of consulting firms, as well as handholding agencies, will be engaged in different stages of smart city development. In the long run, these cities will acquire a brand and an identity based on their main economic activity such as local cuisine, health, education, arts and

craft, culture, sports goods, furniture, hosiery, textile etc. Thus, the smart cities will emerge not only as sites of production and efficient governance but also the sites of consumption. In the event of this, it is likely to spur economic growth and improve the quality of life of its citizens.

At a complementary to the Smart Cities Mission, AMRUT has been launched to cover 500 cities with a population of one lakh and more. The mandate of the AMRUT confines to water supply, sewerage and septage management, storm water drainage, urban transport and development of green spaces and parks including capacity building and reform implementation by the Urban Local Bodies (ULBs). It is envisaged that funding under AMRUT will give first preference to the potential smart cities. A State Annual Action Plan will be prepared (SAAP) in conformity with other central and state government programmes. The state contribution to SAAP should not be less than 20 per cent of the total project cost. The preparation of SAAP will be followed by preparation of SLIP (Service Level Implementation Plans). Under AMRUT, one of the innovative approaches suggested for augmenting water supply is the recycling and reuse of water instead of bringing it from long distances. These two programmes also have a strong complementarity in achieving urban transformation. While AMRUT follows a project-based approach, the Smart Cities Mission follows an area-based strategy. However, both programmes endeavor to promote partnership with State, ULBs and private sectors with Central Government playing a decisive role (see for details www.smartcities.gov.in; www.amrut.gov.in).

Challenges and Implications

The unique feature of India's present urban system is that it has 7935 cities and towns led by three mega cities namely Mumbai, Kolkata and Chennai which grew during British rule along with the national capital of Delhi. They have been followed by second ranking large cities namely Bengaluru, Hyderabad, Ahmedabad

and Pune. The interdependence and inter-linkages among these eight cities together with their regional manifestations and urban corridors has the potential to transform India into a global economic power. However, these cities themselves may not be able to do it as they face huge challenges. Therefore, urban development strategy could play a vital role. The regional inequality, rural-urban divide and intra-city disparities are the strong barriers to India's urban transformation and economic progress. The concept and strategies of Smart city and AMRUT (Atal Mission for Rejuvenation and Urban Transformation) of the present Central Government must be seen in this light. There are many smart cities being proposed for the less urbanised areas of central, eastern and north-eastern India. AMRUT also proposes to cover 500 urban centres out of the 4041 statutory cities and towns in the first

The potential of Smart Cities Mission and its convergence with AMRUT and Housing for All may bring many benefits, but there is a need to safeguard the poor and also the slum dwellers that comprise 65 million as per 2011 Census.

instance. However, there are a large number of Census Towns (3894) which are not covered by either of the two programmes. Census Towns are mostly governed by Village Panchayats, which lack resources and institutional capacity but have the potential to act as a bridge between rural and urban areas. Also, incorporation of census towns in the fold of urban development strategy will be likely to unleash the potential of urbanisation for rural development.

The potential of Smart Cities Mission and its convergence with AMRUT and Housing for All may bring many benefits, but there is a need to safeguard the poor and also the slum dwellers that comprise 65 million as per 2011 Census. These programmes should not be seen in isolation either at the level of governance or at the level of implementation; otherwise they

might lose sight of inclusiveness. As envisaged, smart cities are not meant to widen the digital divide but to help bridge the intra-urban gap as well as the rural-urban divide. The emergence of the idea of the smart city ought to be seen in the backdrop of the need to contain corruption and meet the requirement of adequate and efficient service delivery in urban areas using information and digital technologies. The success of the programmes will be judged in future by its power to transform the life of the people, and their ability to reduce growing inequality in our society.

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(E-mail: rbbhagat@iips.net)

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Cities as Engines of Growth

Isher Ahluwalia



If we define smart cities as cities where residents demand good governance and the government through better administration or high technology is able to deliver high quality services in a transparent and accountable manner, then the Smart Cities Mission has its work cut out to spell out the dimensions of institutional reform together with the high tech infrastructure plans

Indian cities are visibly hugely deficient in the public services they provide. This affects not only the quality of life of the 33 per cent or so of India's population which is urban, but also the investment climate for rapid, sustainable and inclusive growth of the Indian economy.

For quite some time now, the rich and the middle classes in Indian cities have found private market-based solutions to their public service problems, while the poor are also forced into the market to cope for their survival. At present, we have about 420 million persons living in Indian cities and towns and only about half of them are effectively served even for the basic services of water and sanitation. With urban population projected to increase to 600 million by 2031, the challenge of covering the entire population is massive and we ignore it at our own peril. Moreover, if cities are to successfully attract investments for rapid economic growth, the quality of life in our cities must improve by a wide margin.

Cities need to become the engines of growth for India's current stage of development. Industrial development requires agglomeration in order to provide ready access to a myriad support services and this can only

be done in cities. The fortunes of the rural sector are also critically linked to the quality of urbanisation because income per head in agriculture can increase only if people move out of agriculture into 'higher productivity' jobs in industry and services. This shift depends on the ability of the cities to provide a congenial environment for innovation and enterprise which will generate employment. This is especially important since the proportion of the working age population in India's total population is growing and will continue to do so pretty much up till 2040 and even then will begin to decline only modestly.

The General Elections of May 2014 brought in a new government at the Centre. A declared priority of the new government is to bring rapid growth back on track. The average GDP growth of 7.7 per cent per annum during 2001-2011 had slowed down to about 6 per cent per annum in 2011-14. It is estimated to have increased to 7.2 per cent in 2014-15 and this is expected to improve further in the years ahead.

GDP growth in the range of 8 to 10 per cent per annum will have to come from much faster growth in industry and services sectors. There are limits to agricultural growth at 4 to 4.5 per cent per annum even if large investments are made in technology, irrigation and water management. As economies

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go through a process of structural transformation, industry and services sectors acquire rising share, both in output and employment. Indeed urban share of GDP in India is rising rapidly and this is projected to increase further from its current estimated 66 per cent to 75 per cent by 2031. The challenge lies in providing an urban environment which fosters innovation and expands employment opportunities.

Section 1 of this paper spells out the importance of cities as engines of growth in India's current stage of development and juxtaposes this with the current abominable state of delivery of public services in Indian cities. Section 2 presents an estimate of the urban infrastructure deficit and mechanisms for financing this deficit. It argues that institutional reforms are crucial both for reaching out to the private sector for finance and for ensuring that the expansion of infrastructure results in improved service delivery. Sec 3 presents a brief overview of the new National Missions - Swachh Bharat, AMRUT, Housing for All and Smart Cities, launched by the Government of India and emphasizes the importance of incorporating lessons from JNNURM (Jawaharlal Nehru National Urban Renewal Mission), a recently concluded National Mission for Urban Renewal.

Cities as Engines of Growth

Cities will be the principal drivers of growth in India's current stage of high growth and structural transformation. Industrial growth cannot be achieved by spreading out geographically. As investments in industry and services look for urban space to garner economies of agglomeration, both market forces and the government will have to play an important role in generating these economies. Failing this, investors will find diseconomies of congestion and environmental degradation instead of economies of agglomeration and will themselves contribute further to the deterioration in the standards of urban living.

Indian cities which acted as engines of growth in the last 25 years, e.g.,

Bengaluru, Hyderabad, Mumbai, Chennai, etc. have suffered gravely from the consequences of unplanned urban development. The inadequate infrastructure of urban roads, public transport, water and sanitation, and affordable housing combined with poor systems of service delivery has resulted in a significant deterioration in the state of public services and a large proportion of urban population continues to be in slums in these cities.

The current status of service delivery in urban India is a major impediment for cities to act as engines of growth. Scarcity of clean drinking water, contamination of water because of neglect of waste water treatment, water logging and flooding because of poor maintenance of storm water drains, traffic congestion because of insufficient and poor quality infrastructure of urban roads and traffic support infrastructure, air pollution

The current status of service delivery in urban India is a major impediment for cities to act as engines of growth.

because of traffic congestion and irrational pricing of energy are among the familiar challenges in Indian cities and towns. For example, the access to treated tap water is available to only about 60 per cent of the urban population and its delivery ranges from 1 hour to 6 hours daily every third day or so. For sanitation, access to a piped sewer system is available to only 33 per cent. Of the total sewage generated in urban areas, less than 20 per cent is actually treated. As for municipal solid waste, out of the 142,566 metric tons per day waste generated in 2013-14, 82 per cent was collected and only about 29 per cent was processed through composting, vermin-composting, pelletization and waste to energy plants. All this has serious implications for public health and the cities' potential for attracting investments.

India needs rejuvenation of existing cities as well as creation of new vibrant

cities. While new cities will have to be planned along the transport and growth corridors, the tougher challenge is to fix the 8000 or so existing cities and towns. For the Big 6 cities with population above 8 million, as city boundaries have expanded and large villages in the periphery have grown into towns, metropolitan regions are emerging with the core city at the center.¹ Large infrastructure investments are needed to extend the scope of public services to all in these metros and integrated planning of land use and transport is needed to ensure mobility and connectivity. But the larger challenge is to put in place effective institutional structures for metropolitan governance.

As regards cities like Ahmedabad, Surat, Pune and Nagpur, again, a phenomenon of peripheral expansion similar to the big metros is emerging. These cities need urgent attention before the challenges facing them acquire the scale and proportion of those facing the big metros. They require focus on integrated planning of land use and transport, improvement in service delivery and affordable housing. Maharashtra and Gujarat are among the faster growing and more urbanized states, and the state governments will have to create an enabling environment for building capacity at local government level and strengthening the institutions of planning and service delivery to reap the benefits of agglomeration in these fast growing cities. Much the same is needed in the fast growing cities of other states, e.g., Karnataka, Andhra Pradesh, Madhya Pradesh, Tamil Nadu and many other states. Finally, public policy needs to take note of the smaller urban centres in states across the country particularly because of their weak economic base, high incidence of poverty, and lack of access to benefits which are available to rural areas.

The political economy of development in India has remained dominantly focussed on rural development. Even though the Census of India declared that the number of towns increased by over 2500 between 2001 and 2011, towns with

statutory local governments (which are notified by the concerned state government) increased by only 242 over this period. The reluctance of rural local governments to “go urban” arises from the fear of losing large amounts of funds for rural development schemes and from the fear of regulations which urbanisation brings with it.

Even where urban local governments exist, they need to be empowered through devolution of functions, funds and functionaries. In 1992, the 74th Constitutional Amendment formally recognised Urban Local Bodies (ULBs) as the third tier of government, assigning to them the responsibility for the provision of water, solid waste management, waste water treatment, storm water drains, etc. While there has been some progress on transferring the functions from state governments to urban local governments, it has not been accompanied by financial devolution. The local governments also need to be given greater autonomy in raising resources, especially for property tax collection and user charges. As for transferring functionaries, again, there has been very little action in making municipal functionaries employees of the cities and recruited by the cities as opposed to being employees of the state government posted to cities. Only a few states have Municipal Cadres. In the absence of empowerment of city governments, it is no good talking of directly elected Mayors or other such global practices as the panacea for India’s urbanisation challenge.

Investment Requirements and Financing Mechanism for Urban Infrastructure

A High Powered Expert Committee (HPEC Ahluwalia 2011) set up by the Ministry of Urban Development (MoUD), Government of India with the present author as Chairperson estimated the investment requirement to bridge the deficit in urban infrastructure as Rs. 39.2 lakh crore at 2009-10 prices, which is equivalent to Rs. 54.3 lakh crore at 2014-15 prices, not including the cost of land. The estimate covers the period from 2012 to 2031

(assuming average growth of GDP at 8 per cent per annum) for delivering services to the entire urban population including that which was not served earlier and the additional population that would come on board. It assumes that the services will be delivered to the benchmarks laid down by MoUD in 2008. Of the total, the largest share i.e. 56 per cent is for urban roads, while urban transport and traffic support infrastructure account for another 17.7 per cent. Water and sanitation investment requirements constitute about 25 per cent of the total.

The state governments have not lived up to the spirit of the 74th Amendment by not devolving finances to the urban local governments. The need is for predictable guaranteed transfers from the state governments to the local governments, as happens in Indonesia and South Africa. It is

While there has been some progress on transferring the functions from state governments to urban local governments, it has not been accompanied by financial devolution. The local governments also need to be given greater autonomy in raising resources, especially for property tax collection and user charges.

very important to provide for formula-based transfers and grants-in-aid to urban local governments from the divisible pool. Ideally, the opportunity provided by the GST (Goods and Services Tax) should be used to constitutionally ensure sharing by the state governments of a pre-specified percentage of their revenue from GST with local governments. Also, urban local governments should be empowered to levy taxes. Reform of property tax, a major source of revenue for urban local governments, and greater autonomy in levying and collection of user charges would also go a long way in improving the financial position of urban local governments. Setting up of a Municipal Regulator would help in bringing

a degree of professionalism in the pricing of urban services. An hitherto neglected area for mobilizing financial resources for urban local governments is unlocking land value, e.g., tapping land-based financing sources including conversion charges, development charges, betterment fee, etc. and also pricing of floor space index within the overall planning guidelines.

The ability of urban local governments to mobilise external resources for financing urban infrastructure is contingent on their ability to develop a revenue model which enables repayment of the loans raised from the capital market and/or generate returns on investment brought in by the private partner in a public private partnership (PPP) project. This could be done, for example, by levying appropriate user charges for services rendered and/or by realization of some of the increase in land value through betterment charges and/or allowing private concessionaire to develop land commercially as part of the PPP project. Carrying out reforms to strengthen their finances and to improve service delivery would also help urban local governments in improving their credit-worthiness. In this sense better governance through strengthening institutions serves a dual purpose of improving service delivery and also creating a better environment for mobilising finance from the private sector.

National Missions on Urban Development

In 2005, the Government of India finally signaled the importance of the urban sector for the Indian economy by launching a major initiative in the form of the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) with the objective of improving and augmenting the economic and social infrastructure of cities, and providing affordable housing and also basic services to the urban poor. The Mission ran its course from December 2005 to March 2014. Given the federal framework, central government-driven missions of the JNNURM type can only act as catalysts

for pushing the states and urban local governments which have the necessary powers to act in this area. In the book *Transforming our Cities (Harper Collins, 2014)*, I have documented numerous case studies to show how Indian cities in some sectors were able to transform the state of service delivery within a short period. This was possible only when state governments provided an enabling environment for reform and innovation at the city government level, and where there was capacity to plan, implement and manage projects (sometimes because of the presence of a strong municipal cadre) and where city finances were relatively strong. These findings have important implications for the success of the new National Missions for urban development announced by the Government of India.

Swachh Bharat Abhiyan was launched in October 2014 as part of the Clean India Campaign with the objective of eliminating open defecation and manual scavenging through raising public awareness, constructing toilets, and achieving 100 per cent collection and scientific disposal of municipal solid waste. The estimated tag for covering all statutory towns is Rs 62,000 crore. The Government of India would contribute Rs 15,000 crore, and the rest is expected to be financed through the budgets of states/urban local governments, amplified by user charges, unlocking land value, and private sector contributions. Infrastructure and institutions are necessary but not sufficient. The success of this Mission depends to a large extent on achieving behavioral change and using behavioral psychology to nudge people in the direction of maintaining good sanitary conditions. However, a key physical constraint is water availability. Toilets will not work if water is not available.

In June 2015, the Government of India announced three major National Missions: Atal Mission for Rejuvenation and Urban Transformation (AMRUT), Housing for All by 2022, and Smart Cities Mission. AMRUT is in a sense

the successor to JNNURM. It covers 500 cities and focuses on infrastructure for water, sewerage, drainage, transport and green spaces. It is effectively a centrally sponsored scheme with a total outlay of Rs. 50,000 crore over a 5 year period. Like JNNURM, disbursements will be linked to a set of reforms. Unfortunately, municipal solid waste management is not in the ambit of AMRUT although this is critical for sanitation. The challenge for AMRUT will lie in enforcing the conditionality of reforms, precisely the area where JNNURM failed. Since most city governments did not cross the threshold of reforms that would generate a credible revenue model, not much success could be achieved either in getting finances through public private partnership or in accessing the municipal bond markets.

The challenge for AMRUT will lie in enforcing the conditionality of reforms, precisely the area where JNNURM failed. Since most city governments did not cross the threshold of reforms that would generate a credible revenue model, not much success could be achieved either in getting finances through public private partnership or in accessing the municipal bond markets.

The Housing for All Mission targets creation of 2 lakh crore houses by 2022. KPMG has estimated total housing need by 2022 allowing for new demand at about 11 crore houses. The government mission will therefore service only a part of the need and that will relate to the demand from the Economically Weaker Sections. This is estimated to require a grant of Rs. 1.5 lakh per house plus an interest subsidy on bank loans. The success of the scheme will depend critically upon state governments being able to provide the land, provision of adequate funds by the central and state governments, the willingness of banks to lend in the absence of government guarantee of the loan, and the ability

of the state governments to provide the necessary urban infrastructure. It is worth noting that rental housing, which has the potential to cater to very low income groups, has remained largely untapped as a policy alternative. This is an important lacuna which should be addressed.

The Smart Cities Mission is an ambitious mission aiming at enhancing the quality of urban life and providing a clean and sustainable environment to 100 selected cities with smart solutions. It is in line with a worldwide trend in favour of “smart cities” although there is no precise definition yet of what constitutes a smart city. The Government of India has committed Rs 48,000 crore over a 5 year period for the 100 cities which will be competitively selected. The scale of funding does not match the ambition. The Mission will opt for retrofitting and/or redevelopment of certain pockets of existing cities, and will also develop greenfield smart cities. Intelligent transport solutions with city-wide impact are also on the agenda. A Special Purpose Vehicle will be set up to drive the Smart Cities Mission unlike AMRUT which will be driven by urban local governments. If we define smart cities as cities where residents demand good governance and the government through better administration or high technology is able to deliver high quality services in a transparent and accountable manner, then the Smart Cities Mission has its work cut out to spell out the dimensions of institutional reform together with the high tech infrastructure plans.

There is no doubt that within the economic and political constraints we impose on our cities within our federal regime, it is possible to do far better than what most of them are currently doing. But to bring our cities anywhere close to world class, we will need to reform the political environment in which our cities function.

Endnotes

1. Mumbai, Delhi, Kolkata, Chennai, Bangalore and Hyderabad

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Smart Cities in the Indian Context

Usha P Raghupathi



In India's quest for Smart cities, examples have been cited of Singapore, Vienna (Austria), Songdo (Korea), Barcelona (Spain), to name a few. While India can look at the developed nations for inspiration, it must find its own solutions to make cities technologically advanced and make them function well. Sustainable development and sustainable solutions should be the ultimate goal of developing smart cities

India has finally woken up to the fact that urban India is now growing faster than rural India in absolute terms. Urban India added 9.1 crore people to its population base¹ during the decade 2001-2011 as compared to rural India's 9.0 crores. Till the launch of JNNURM, the fund allocation for the urban sector was insignificant as compared to the rural sector. JNNURM brought a paradigm shift to India's thinking. It recognized that urban areas played a key and central role in India's economic growth and development.

Cities drive economic growth in India, generating at least two-thirds of the country's GDP. Unless good quality, efficient infrastructure and services are provided in cities, India's economy will not be able to achieve the ambitious GDP growth rate of 8 per cent or more.

As per the Census of India, 2011, there are 4041 Statutory towns and 3894 Census towns (areas declared as urban as per Census of India definition) in the country. Nearly 70 per cent of India's urban population lives in urban agglomerations and cities with a population of 100,000 or more. While most of these cities are growing rapidly, the megacities (5 million and above) are bursting at their seams. Cities, especially those that are growing rapidly, need to be better planned with

smart solutions. Currently, India's urban areas face numerous problems such as lack of adequate infrastructure and basic services, poverty and slums, inadequate housing, mobility issues, congestion, pollution of all types etc. Added to these are the climate change problems and the ever increasing natural and man-made disasters in urban areas. These problems need smart solutions and good governance.

Most cities in India do not have master plans and therefore, unplanned urbanization is of great concern especially for provision of infrastructure and services. Most peri-urban areas are 'no governance' areas as they are neither rural nor urban. As cities expand, the peri-urban areas, which are mostly unplanned areas, are brought into the cities' jurisdiction. There is thus, a need for planning to precede growth of cities, as retrofitting and redevelopment is a much more difficult exercise.

The present government's flagship programmes – 100 Smart Cities, 500 Cities under Atal Mission for Rejuvenation and Urban Transformation (AMRUT), National Heritage City Development and Augmentation Yojana (HRIDAY), Swachh Bharat Abhiyan, and Housing for All aim at making cities livable, inclusive, vibrant, technologically advanced and economically competitive. According to the Ministry of Urban Development (MoUD), Government of India, the

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core infrastructure elements in a smart city would include:

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; vii. Good Governance, especially e-Governance and citizen participation; viii. Sustainable Environment; ix. Safety and security of citizens, particularly women, children and the elderly; and x. Health and Education.

“The strategic components of area-based development in the Smart Cities Mission are city improvement (retrofitting), city renewal (redevelopment) and city extension (greenfield development) plus a Pan-city initiative in which Smart Solutions are applied covering larger parts of the city” (MoUD website – Smart City Strategy).

Smart cities conjure up thoughts of cities that function well and have everything going right. Cities where all have access to basic services, the services are efficiently provided, the cities are clean, there is a well functioning transport system, cycle lanes, pedestrian paths, green lungs, water bodies, green buildings, green energy, e-governance, use of digital technology in daily life, efficient information and communication systems and so on. We need to work on all these fronts to transform our cities. Smart cities must also be ahead in visioning the future of the city and making provisions for future expansion.

Smart cities in the Indian context must include the following aspects: technology, financing, data access, energy, environment, climate change resilience, disaster risk management, reforms, governance, and citizens.

Technology: Digital technologies can provide innovative and efficient solutions for managing cities – be it for mobility (traffic and transportation), urban planning or provision of infrastructure and services such as water supply, sewerage system, solid waste management, etc. Smart cities

should reduce congestion on roads and consequently air pollution, with co-benefits of better health and improved quality of life. Use of sensors and providing real time information will transform the way services are managed and also how people use services. Providing digital meters for water and electricity inside houses, where citizens can monitor their usage and tariff, will help in conservation and intelligent use of essential services. Information and communication technology should also be able to cater to the social sector and be inclusive i.e. make innovative solutions and services accessible to the aged, disabled, poor, and illiterate.

Financing: There are numerous technology providers, who can provide solutions for different sectors. However, these will need funding. Municipal governments in many cities today are in financial distress, unable to even maintain basic services and pay regular salaries. Therefore, the smart city initiatives will need funding from higher levels of government, financial institutions, private sector, or funding by international agencies. The capital investment will need to come from government and private sector, and the long term maintenance expenditure will need to be paid for by users through user charges.

Data access: Smart cities should offer open access to information on infrastructure and services – especially those that are connected to citizens. This requires generation and maintenance of standardized information on services for each city. Technology will also enable crowd sourcing of information that under normal circumstances will be difficult to obtain. These can also be real time data. Access to information will empower service providers and users alike, which will help in improving the quality of life of citizens.

Energy: Green and clean energy (renewables), smart grids, intelligent green buildings that optimize the use of energy and natural resources should become the norm for smart cities. This will also contribute to the climate mitigation efforts and GHG emission reduction targets that India has agreed to in global negotiations.

Environment: Green areas that

promote bio-diversity, green areas (parks, forests) that act as carbon sinks, open spaces for citizens to interact with each other, clean air, creation and preservation of water bodies that collect rain water, recharge ground water and also act as sponges during heavy rains should all become the hallmark of smart cities.

Climate Change Resilience:

Smart cities should be climate resilient. This means that right at the time of planning for smart cities, resilience to the impacts of climate change should be built in. In the water sector, for instance, this would include rainwater harvesting, recycling of wastewater, identifying multiple sources of water supply, recharge of aquifers, promoting water conservation, and so on. This would enable the city to cope with water shortages that are likely to result from climate change. Another example would be reducing the dependence on a single source of power by decentralizing power generation, e.g solar rooftops.

Disaster Risk Management:

Multiple types of disasters are striking cities with regularity and this is likely to increase given the climate change projections. Smart cities need to be prepared for disaster management at all times. The disasters could be floods, earthquakes, fires, landslides etc. The smartness of the city will be put to test during the time of disasters and therefore, this aspect needs to be incorporated in planning for smart cities.

Reforms:

Urban India needs to not only implement the reforms advocated under JNNURM, but needs to implement the next generation reforms that were put together for the next phase of JNNURM. Implementing reforms is the only way to sustain the changes and maintain infrastructure and services.

Governance is an extremely important part of managing cities well. The main difference between the developed and developing world is not just technology, but governance. Rules, regulations and their enforcement play a major role in how cities function. India has very good laws, rules and regulations in every sphere, but has had a very poor enforcement record. Smart cities will require strong governance,

aided by technology. Our institutions of governance at local level must coordinate and cooperate with each other and not work in silos, as they do today in most cases. There must be information sharing between agencies and departments to improve governance. Political will is as important in governance as putting systems in place. Elected leaders ultimately determine governance in a democratic country like India. Smart cities should have transparent and accountable governance. Vertical and horizontal integration in governance is the key to managing cities well.

One of the major problems in bringing about any change in Indian cities is the capacity of institutions and individuals is to adapt to and manage change. New technologies and new ways of functioning will require new knowledge and skills. Governance can be improved only when providing such knowledge and skills to the city functionaries becomes a regular and an on-going activity.

Citizens are central to the success of managing any city. The administration can and must create avenues for citizen participation in every sector and every area. Smart cities must have a governance structure that encourages citizen's participation. This will make citizens own the city and be a part of its decision making. However, citizens must also be made responsible for maintaining the infrastructure and services. Providing high-tech solutions in smart cities will require information, education and communication (IEC) to change citizen's behavior and response. The behavior can also be changed by enforcement of laws and regulations.

Technology should empower citizens with information that is useful and usable. Smart cities should make information accessible to all citizens via mobile phones, computers, information kiosks, etc

India is a vast country and diverse in terms of geography, culture and levels of development. The diversity of the country should be taken into account while planning smart cities. The 'one size fits all' solutions will not produce the desired results. We also need to give importance to indigenous knowledge and local solutions.

In India's quest for Smart cities, examples have been cited of Singapore, Vienna (Austria), Songdo (Korea), Barcelona (Spain), to name a few. While India can look at the developed nations for inspiration, it must find its own solutions to make cities technologically advanced and make them function well. Sustainable development and sustainable solutions should be the ultimate goal of developing smart cities. Unless we can improve governance and change people's mindset and behavior, we may not be able to achieve our dream of making India's cities like the smart cities of the world. We may be able to create smart cities, but we need to transform governance so that these cities do not revert back to the current state. We need to prepare everyone for the change.

Endnotes

¹ The urban population in 2001 was 28.6 crores while the rural population was 74.3 crores. ■

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SAMPLE CASE STUDY

Mr A is preparing for the prestigious civil services examination but he is not satisfied with the way UPSC is framing questions for the Ethics paper as he thinks:

- (1) Anyone with rote memorisation of definition of key words mentioned in syllabus can master the subject.
- (2) The questions in the paper are not testing the real attitude ethical nature of the students and even unethical students can score good marks in it.
- (3) Ethics cannot be tested with written paper.
- (4) Anyone can pretend to be ethical in exam but in practice he will become pliable, corrupt and accommodative to wrong practices defeating the very purpose of this paper.

Critically analyse the above view points. On the basis of this analysis, what will be your advice to Mr A? Do you think that civil service examination is adequately testing ethical behaviour of candidates? Give your views. [250 words]

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Digital Governance In Smart Cities

R Chandrasekhar



Manual intervention where there can be digital, is what leads to inefficiencies, underutilization and leakages. Let us spend some time and see how technology can be leveraged to govern these cities far more effectively, and render them truly world class

Popular estimates predict that by 2050, sixty-four per cent of the developing world will reside in urban locales, and in developed nations this number is posited to be a high eighty six per cent. Rapid urbanization draws the focus on cities, and the increasingly pressing need for them to be “smart.”

Prioritization of various initiatives- that come under the purview of smart cities - becomes imperative because of specific needs that a city may have. The next step would entail attracting investments and pinning down the key physical and IT infrastructure that would be required, with some exactitude.

City Governance: Myriad Challenges

Public and private agencies help deliver services to citizens. These services are many and varied, and often end up in a mish-mash of complex relationships involving the stakeholders, which preempts the need for collaboration and governance. The ecosystem - if it can be termed that - is constituent of: city governance, operations and maintenance, public infrastructure asset management, integrated operations and citizen services. Manual intervention where

there can be digital, is what leads to inefficiencies, underutilization and leakages. Let us spend some time and see how technology can be leveraged to govern these cities far more effectively, and render them truly world class.

City Governance seen through a common lens would reveal fragmentation and duplication of institutional roles; lack of capacity; funding constraints; limited autonomy; and weak link with citizens. Training modules (online) for ULBs and other departments, help address capacity building. Similarly, workforce management can be done more effectively with the aid of resource optimization applications. Automated business processes are known to minimize human intervention. In addition, citizen-centric online portals help the government to connect with citizens and seek their ideas & feedback.

The approach towards operations and maintenance is often ad hoc, where performance of the service provider is not clear, marked by a non-integrated city management approach, and of course the perennial issue of manpower shortage looms large. In short, a reactive state of affairs which can be avoided. City performance dashboard provides an opportunity to track performance and empowers

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the citizens to question on the quality of service delivery. Transparency in working of various departments can be encouraged with the aid of integrated command and operations centre. Predictive Analytics can help understand maintenance cycles better, which will ultimately catalyse better performance.

There is no provision for effective planning of public infrastructure and assets. Often the inventory is outdated and records maintained are manual, which leads to a lack of comprehensive asset management strategy. Integrated asset management solutions lower operation cost by improving asset maintenance practices and provide visibility on asset, its usage, including maintenance.

Multi-channel citizen interfaces like mobile, web, face-to-face, kiosks and social media can assist in delivering various citizen-centric services such as bill payment, tax, on-line issuance of certificates and registration of grievances. Social media has proven to be a very powerful two-way communication channel.

Potential ICT Enablers: Overview

- **Business Process Automation:** Re-engineer, optimize and automate business processes using Business Process management solution to have a fully integrated and policy-driven set of automated business processes that increases efficiency and reduces service delivery costs.
- **Multi-Channel Citizen Services:** Multi channel citizen interface (Mobile/web/online/phone/face to face/kiosk/social media) for citizen services such as bill payment, tax payment, birth certificate, grievances registration etc.
- **City Performance Dashboard:** Monitor the performance of city sub systems through the use of digital technologies and big data analytics to manage city governance, efficient performance and proactive crisis management.
- **Integrated Asset Management Solutions:** Integrated asset management of all governance infrastructure assets including

the associated data, processes, information systems and governance for manageable operations and higher sustainability.

- **Integrated Command & Operations Center:** Leverage integrated command and operations center to monitor city services on real time. Improve/synchronize maintenance activities to reduce downtime and improve maintenance effectiveness.
- **Multi-Channel Citizen Communication:** Multi channel customer interface (Service desk/contact center/citizen services portal) help in recording citizens requests/issues via multiple channels like face to face, web, mobile, kiosk etc.
- **Workforce and Resource Management:** Leverage the workforce and resource management solutions to improve workforce engagement and task management. Optimize the workforce with the

help of workforce management solutions like planning, forecasting and scheduling, shift management, mobile applications to execute tasks and efficient performance management tools

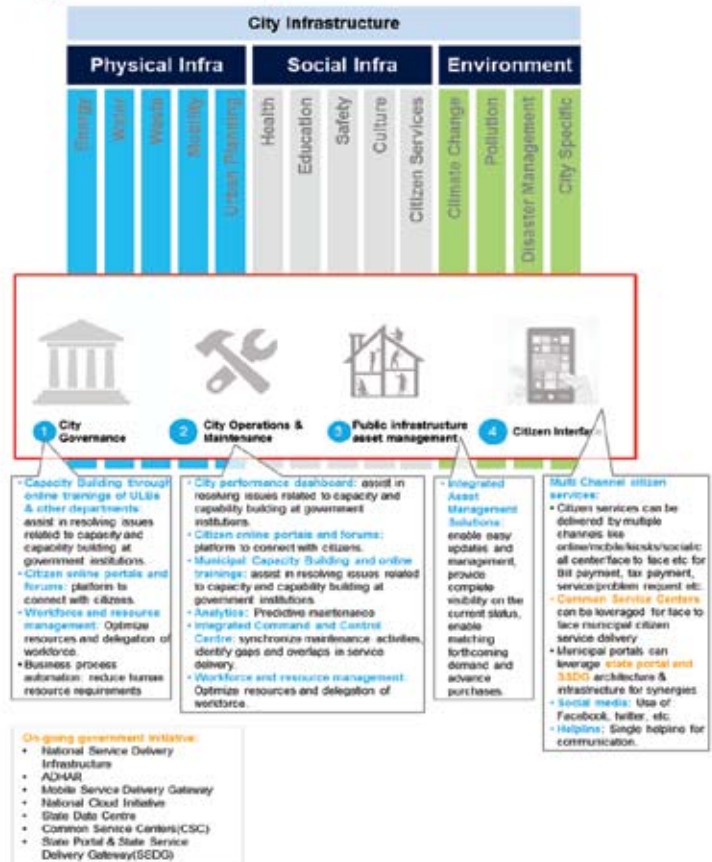
Existing ICT investments and initiatives which could be leveraged upon:

National Service Delivery Infrastructure:

It will act as core infrastructure for achieving standards-based interoperability. Eventually it will evolve to build a government owned central gateway. This will secure messaging and interoperability between various e-Gov applications; de-link the back-end departments / service providers from the front-end service access providers; and will be the shared services hub for departmental applications like payment gateway services, mobile gateway services etc.

City Governance Driven by Leveraging ICT Tools aZnd Solutions

Smart City Governance and Operations



AADHAR:

The UIDAI / AADHAR will offer a strong form of on-line authentication where agencies can compare demographic and biometric information of residents with the records already existing in the central database. The purpose of UIADAI / AADHAR is to issue a Unique Identification Number to all Indian residents and eliminate duplicate / fake entries.

Mobile Service Delivery Gateway:

Mobile governance, popularly known as m-Governance aims to leverage wireless and new media technology platforms, mobile devices and applications for delivery of public information and services to all its citizens. It will widen the scope and outreach especially in rural areas where mobile penetration is much more than the internet. The overall strategy is to make India a world leader by harnessing the power of inclusive development.

National Cloud Initiative:

"Meghraj" initiated by DeitY is a GI Cloud, a Govt. of India Cloud, which will act as a common repository of cloud-based infrastructure resources and applications available on demand. These include optimal utilization of ICT infrastructure; speedy development and deployment of e-Gov applications; quick replication of successful applications and an e-Gov store, hosting certified services.

State Data Centre:

SDCs have been provisioned for the states to consolidate services, applications and infrastructure to provide efficient electronic delivery of G2G, G2C and G2B services. These services can be rendered through State-Wide-Area-Network (SWAN) and Common Service Centres (CSCs) extended upto village level.

Common Service Centers (CSCs):

CSCs provide high quality and cost-effective video, voice and data content services in e-Gov, education, health, telemedicine, entertainment as well as other private services. It offers web-enabled e-Gov services in rural areas including application forms, certificates and utility payments such as electricity, phone and water bills.

State Portal and State Service Delivery Gateway (SSDG):

The National e-Gov Plan aims to make all govt. services accessible to the common man in his / her locality through common service delivery outlets to ensure efficiency, transparency and reliability. All this at an affordable cost. The govt. desires to create an integrated information infrastructure that will expand, integrate and enhance the utility services to have a broader outreach.

For the IT BPM industry all these initiatives could not have been better timed. In scope, these projects are all giants in their own standing, and would call for a collaborative approach from the industry to see them fructify and achieve desired results. A 146 billion dollar industry which has paved the way globally and implemented some of the most robust solutions in faraway shores, is now at the crossroads. Time to replicate that success here in India, and provide a huge boost to domestic growth. □

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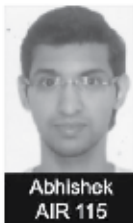
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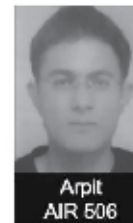
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Smart Housing for Smart Cities

P S N Rao



Housing deserves to be rightfully at the centre of any economic strategy for development. One of the best ways of achieving high growth rates is by giving a strong impetus to the housing sector

The Government of India has finally launched the Smart Cities initiative as a flagship programme under the Ministry of Urban Development, with a view to meet the challenge of urbanization in the country. While only 31 per cent of the population of India lives in urban areas, it contributes as much as 63 per cent of the Gross Domestic Product (GDP) as of 2011 and this is slated to rise to 75 per cent by 2030. Obviously, this requires comprehensive development of physical, social, economic and institutional infrastructure so as to prepare and manage the challenges posed by this kind of growth.

The programme of Smart Cities aims to help cities acquire better infrastructure which includes water supply, electricity, sanitation, mobility, affordable housing, digital connectivity, sustainable environment, safety and security, health, education and good governance with citizen participation.

In the entire gamut of things, finances are the key. This has been addressed by a huge budgetary allocation of nearly Rs.50,000 crores.

This works out to Rs.100 crores for each city every year, for 5 years, for 100 cities. In addition to this funding which is to come from the Central Government, funds can be mobilized from various other sources as well. In the entire process, *efficiency* is the key to achieving smartness. In order to achieve efficiency, use of modern technology is imperative.

The official figure of urban housing shortage in India has been estimated to be around 25 million dwelling units. By any stretch of imagination, this is a huge figure which can, by no means be easily fulfilled. While there is absolutely no room for doubt that the housing requirement in the country is humongous, the problem is more acute in the urban areas rather than in the rural areas. Further, the question becomes more complex when we look at the kind of population segment which is more in need of housing than the others. A large number of low and middle income families need housing which is reasonably priced (affordable) while a relatively small number of families can afford to pay for large or high priced housing. Therefore, the demand is more for budget housing products while the affordability is limited. Unfortunately, the reality is

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that housing being produced in the market is actually the other way round; very little produce of budget housing and plenty of housing options for high income housing. This is the housing dilemma in India. Further, the demand – supply gap only helps in pushing the prices higher and higher. The outcome of this spiral is that people, particularly, the low-income and the poor have no other choice but to take to illegal options.

Past Imperfect

The Indian housing story over the last sixty years has moved from strong state interventions in the early years of independence from the 1950's onwards towards a liberalized regime of private sector initiatives and partnerships towards the end of the century. In more recent times, however, housing development in India is being perceived more and more as an activity which cannot be without the active participation of the private sector, be it entrepreneurs, corporate companies, cooperative societies or individuals themselves. This is a realization that has dawned on the Government of India and in the recent past, efforts have been made to encourage the private housing enterprise, unfortunately, with few safeguards to provide for the masses.

The public sector housing agencies which were created after Independence to provide reasonably priced housing viz. state housing boards and development authorities have left much to be desired. The housing supply of these agencies has declined substantially in the recent times. These agencies were mostly funded by the Housing and Urban Development Corporation (HUDCO) and over the years, got embroiled in various difficulties in servicing the loans taken. To add to the misery, these agencies have actually now taken to developing high priced housing, obviously catering only to the high income - high affordability groups of the population. The large number of public-private-partnerships created in the last few decades have mostly

catered only to the upper incomes and precious little housing has been created for the low income population. Sadly, the structuring of these partnerships leaves gaping loop holes in the way the governments have played into the hands of the real estate enterprise.

On the other hand, state governments have also been actually promoting high end housing through township policies and public-private partnerships. In fact, even the entire housing finance system in India is thriving on providing mortgage housing loans to the 'well to do' salaried formal sector employees,

Singapore and Hong Kong are two South Asian cases in point. Both have developed housing policies which addressed the needs of the day and pushed forward enormous housing supply into the market that there is no shortage at all, there is enough housing for all!

taking shelter under the fact that low income population is not credit worthy. Therefore, government commitment to housing the large majority has come down drastically.

As a result, there is a glut or oversupply of housing for the high income population and the middle and low income population have to put up with the brunt of the burden. Invariably, they end up in high priced rental housing at good locations (to save on commuting time and money for transportation), far off locations which are within their affordability (but difficult on commuting time and transportation) or end up in informal/quasi-legal settlements where the prices are more affordable, albeit the lack of services. Low income housing projects are hardly being developed these days in the formal sector.

The Government of India set up a High Level Task Force in the year 2008 to look into the various aspects of providing affordable housing. This Task Force came up with a definition of affordable housing as a) 300 to 600 sft carpet area housing for EWS/LIG

with a cost not exceeding four times the gross household annual income and EMI / rent not exceeding 30 per cent of gross monthly income and b) 1200 sft carpet area housing for MIG with cost of house not exceeding five times gross household annual income and EMI/rent not exceeding 40 per cent of gross monthly income.

Assuming that this is correct, if one were to look at the policies and projects being promoted by the state governments in various states of the country, one can see that few have been following the recommendations of this Task Force.

The Government of India has been pursuing orthodox policies and programmes, the most recent being the Rajiv Awas Yojana to generate low income housing. All these are old wine in new bottles. There are no significant departures so as to create a dent in the supply side of the market. They significantly suffer from the continuance of orthodox bureaucracies and inadequate capacities for speedy and quality implementation.

There are quite a few real estate companies who have recently entered this space of affordable budget housing segment and only time will tell how they are going to deliver.

Global Experience

There are many countries where there has been an acute housing problem in the past and have seriously acted and tided over the same. Singapore and Hong Kong are two South Asian cases in point. Both have developed housing policies which addressed the needs of the day and pushed forward enormous housing supply into the market that there is no shortage at all, there is enough housing for all! Strong political will, active development mechanisms, clear construction strategies, innovative financial systems and use of modern technology have all led to 'smart housing'.

Post War housing in Europe is another example of strong state intervention and political will to reconstruct neighbourhoods and

communities. Totalitarian examples exist in the Socialist block where again, it was strong political will which has paved the way for creating huge supplies of housing stock. There are many other countries with different political ideologies which have all acted strongly and seriously to solve the housing crisis. We in India, do not seem to be learning any lessons from either of these experiences.

Keeping the cost of land and infrastructure aside, if one were to only look at the built housing units, technology comes out as a key focus area to achieve these monumental numbers in a speedy manner. Housing on a large scale can only be developed by way of industrialized mass production. Unfortunately, in India, we still continue to build houses, be they stand alone units, walk-up apartments or multi-storey apartments, in the conventional 'a-la-carte' manner. This will do no good for us. What we need are systems and procedures which can speed up the whole process of housing production so that we can achieve scale economies in production and consequent savings.

Efforts in India

The technology scenario for housing production in India has been extremely orthodox for several decades now. We continue to dabble with conventional materials and systems of construction. Even though some small advances in terms of some alternative materials have been made, their adoption and application has been severely limited to experimental projects which also have been few and far between. Colleges of engineering and architecture continue to propagate usage of age old materials and methods which are completely obsolete in the existing global scenario.

Transfer of technology from lab to land has also been very dismal. Most efforts remain on the drawing boards or in experimental stages. Promotion of whatever little is there has also not been happening. The Government of India initiated the Building Centres which were supposed to promote various technologies. Unfortunately,

many such centres have become non-functional and more are on the road to closure. Most civil engineers and architects are not even made aware of the existence of a Building Materials and Technology Promotion Council created by the Government of India for promotion of technology.

Unfortunately, the whole approach to address housing technology in India has been very inappropriate and completely out of sync with what is happening the world over.

A Case for Industrialised House Production

Globally, mass housing has always been a factory produced product, unlike in India. The advantages of mass production are several. Firstly, there is standardization on account of which the benefits are obvious; there is ease of adaptability and no wastage. Secondly, factory production leads us to enhanced speed of construction. Time saved is money saved. Thirdly, quality of building products can be easily monitored and ensured in controlled environments. Fourthly, scale of economy can be achieved and thereby, affordability is possible. Lastly, in prefab housing, there is no construction wastage and this again contributes to economy. In most advanced countries where labour is a problem and weather conditions do not permit a large number of construction days, housing has to be necessarily put up in the least possible time. This has necessitated the development of technologies and systems of production and assembly in a quick manner where houses can be put up in a matter of days, as compared to years in India.

International Practices

In all the developed countries, mass housing has always been by way of factory production. As a matter of fact, this technology was first developed over a 100 years ago after the First World War and perfected over the decades. There are various ways in which these have taken shape as discussed below :

Modular Homes – This system comprises of various housing

components manufactured in a controlled factory environment and simply assembled at site. Almost 90 per cent of the house including walls, flooring, ceiling, stairs and finishes are made in the factory. The assembly of these at site takes a mere 1 day for 1 house ! Besides savings in cost and time, excellent quality and finish can be obtained.

Panelised Homes – This system involves advanced construction techniques to develop energy efficient durable houses built in a factory environment. The scope for customization of design is more here. With the help of computer assisted design programmes, houses can be designed to suit individual pockets and produced accordingly in the factory. Wall and roof panels are engineered and fabricated in a manufacturing plant and shipped to the home site for assembly in a few days. State-of-the-Art technology ensures that panels are manufactured with quality and precision with dimensional accuracy and meeting code provisions. They are also disaster resistant. Factory assembly means reduced construction material waste, less job site disturbance and easier clean-up. Panelized building is an inherently green way to build and is recognized in several green building certifications. All this saves time, effort and money at the end of the day.

Log Homes – Contrary to the popular belief that timber construction is not environment-friendly, commercial timber production is done without seriously damaging the environment. Trees are a renewable resource and log home construction earns points as a green building material. Pre cut home kits are designed and delivered at site for assembly. This is an organic and simple way to build. Such buildings are also energy efficient and thermally comfortable.

Concrewall - One of the most popular European systems which has recently made inroads into India is the Concrewall system. This construction system is based on modular elements made of shaped polystyrene panels that are contained between two sheets of galvanised welded meshes. The

vertical mesh wires are set along the polystyrene 'waves', thus creating reinforced concrete micropillars once the panel is coated with concrete. The above wires are bound to each other by the mesh horizontal wires and joined orthogonally by the links which keep the two meshes together. Joint twisting is prevented by welding; in other words, as these joints are all welded, all transversal and longitudinal motion is prevented resulting in absolute indeformable panels.

One would be quick to argue that we did try industrialized housing in India and failed and therefore, there is no place for the same here. This line of argument does not hold water since the Hindustan Housing Factory experiment in the early decades of India's independence was like any typical loss making PSU, toying with outdated panel technology which has already been discarded for much better technologies. It is therefore, high time that we bring about a complete shift in the fundamental paradigm of housing construction.

Way Forward: Towards a Housing Revolution with Smart Technologies

Today, the modern technology to suit Indian weather conditions and social acceptability is available and at a cost which is comparable, if not lower than conventional construction systems. If one takes into account other factors such as time saved, quality, etc., the benefits are many more. All we need to do now is to create the facilitative environment: the appropriate legal,

fiscal and techno - regulatory regimes for international companies to plant these technologies in India so that we can achieve the much needed paradigm shift in housing construction from the age old 'a-la-carte' system to a more sophisticated factory production system. Both the MoUD as well as the MoHUPA need to initiate steps if they are serious of solving the housing crisis in the country.

At the end of the day, it is all a numbers game. We need a slew of measures that can make a housing revolution happen in India too. *Firstly*, what we need is supply and that will happen only by way of speedy construction. Modern construction techniques are today available to make this happen. Prefabrication construction technology has undergone tremendous advancements in the recent past. Many companies are doing the rounds in India today trying to sell these technologies. Unfortunately, our governments are blissfully ignorant of these, forget about implementing them. *Secondly*, to make supply happen, we need land, the most crucial input at a reasonable price. This is where governments need to subsidise. Alternatively, governments need to come out with creative models of land sharing and bring in more land into urban development. Very high densities need to be permitted. Today what we have is a completely low density and inefficient way of utilizing urban land, thanks to the outdated regulations. *Thirdly*, we need financial intermediation so as to achieve inclusion. Most middle class and low income population who do not meet the usual requirements of credit-

worthiness need to be roped in through innovative methodologies which are already being tried out by some micro-housing finance corporations. With these strategies in place, we can surely make some headway and satiate some of the demand in the coming decades, if not completely. *Lastly*, housing estates without good transportation connectivity and infrastructure in terms of water, etc. would only give us ghost townships.

Housing is an economic activity which has backward and forward linkages with as many as 260 industries. More than the skilled employment which it would provide in any case, a majority of the employment that it would generate would be in the semi-skilled and unskilled sector. Rural unemployed, women labour, seasonal and marginal workers would find gainful employment for a greater part of the year. Housing deserves to be rightfully at the centre of any economic strategy for development. One of the best ways of achieving high growth rates is by giving a strong impetus to the housing sector. Unless and until, we learn the lessons from success stories in our geo-political neighbourhood, we will not be able to make any progress. This only speaks volumes of the lop-sided economic policy which we are pursuing; we have done too much mindless talking in this area, too little breaking of the ground ! We can only hope that the Housing for All by 2020 will actually bring in 'smart technologies' to kickstart the housing revolution in India. □

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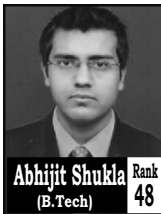
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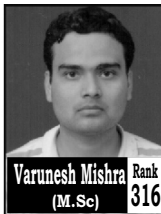
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Suresh Yadav



The Smart City initiative introduced at Rashtrapati Bhavan has already garnered a positive feedback because of the various simple yet innovative e-governance systems operating to provide fast and efficient delivery of services

The magnificent edifice of Rashtrapati Bhavan is one of the largest buildings of its kind in the world. It is a vast mansion having a breathtaking architecture. Designed by the British architect, Sir Edwin Lutyens, it is a mixture of both Indian and Western schools of architecture. It was primarily designed to be the home of British Viceroys of India and was called Viceroy's House. However, on 26th June, 1950, it was renamed as Rashtrapati Bhavan—official residence of the President of the largest democracy in the world.

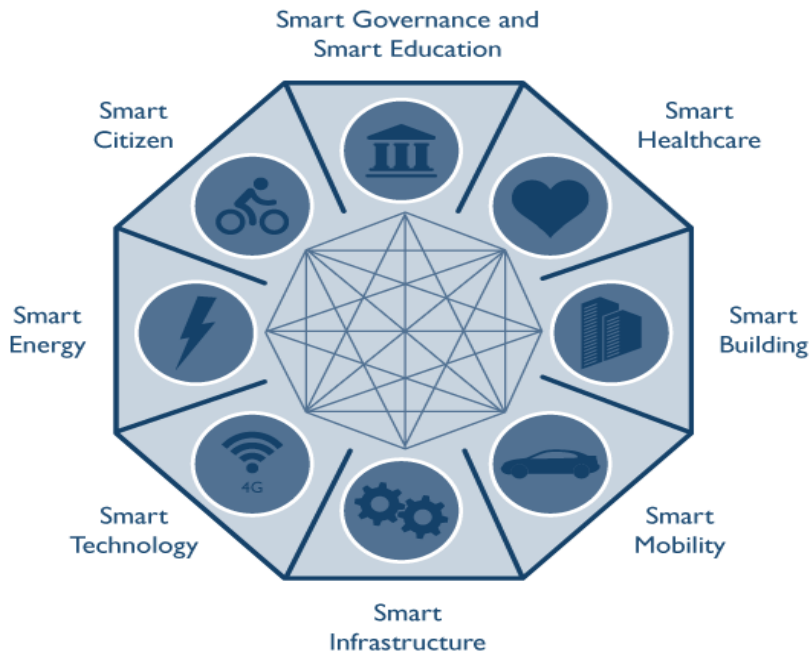
The building stands on a 330-acre estate and itself covers an area of five acres. The majestic structure is an H-shaped building which is 195 meters wide and 165 meters deep. It comprises of 340 rooms and a two-and a half-kilometer of corridors. It has 4 floors with 227 columns and 37 fountains. The central dome that crowns Rashtrapati Bhavan has been inspired from the Great Stupa of Sanchi. The pillars of Rashtrapati Bhavan have Indian temple bells which signify the composite culture of Hindu, Buddhist and Jain traditions. The front facade of Rashtrapati Bhavan is called the Forecourt which is a 200-meter-long colonnade. From the Forecourt, the path which leads to the Portico, lies the great piece of sculpture—the Bull Capital of Ashoka Pillar. In the middle of the foreground stands the

Jaipur Column on top of which is the Star of India. The building is an office to more than 3000 people employed at Rashtrapati Bhavan and more than 8000 people reside in its residential complex i.e., the President's Estate.

The Reception of Rashtrapati Bhavan is a big hall which offers entry passes to the visitors to see the exotic sites which this heritage structure has to offer. Through reception, people get the opportunity to see:

- a) **The Marble Hall:** It exhibits the rare portraits of the Viceroys and of the British Royalty along with sculptures and artifacts of the British period.
- b) **The Durbar Hall:** A large hall having rich yellow marble of Jaisalmer and majestic chandelier as well as the statue of Gautama Buddha. Post-independence swearing-in ceremony of the new government took place at Durbar Hall on 15th August, 1947.
- c) **Library:** A grand dome of knowledge which contains a collection of over 2000 rare books published from 1800 to 1947.
- d) **Ashoka Hall:** It was originally known as the Ball Room of Viceroys. It is currently used for holding all the ceremonial functions of Rashtrapati Bhavan. The hall is distinguished by its magnificent painting of Fateh Ali Shah on its ceiling.

The author is OSD to the President of India.



and traffic management, energy, health care, water and waste management etc. The idea of converting Rashtrapati Bhavan into a “Smart City” was conceived with the objective to advance in the path of development. The adoption of this initiative would make it and the President’s Estate the first-ever smart city in India. All the necessary parameters would be introduced which can convert the 330-acre rich heritage site into a well-functioning and self-sustaining township governed by ICT.

Four principle parameters were identified under the broad outlay design of Smart City at Rashtrapati Bhavan. These were:

E-Services: Involving the utilization of digital technologies to improve the efficiency and effectiveness of urban services.

Co-production: Involving creation of opportunities through technology for the residents to participate in the production of public services.

E-Democracy: Involving the utilization of technology to enable the citizens to shape public policies and public actions that affect people’s lives.

Transparency: Involving utilization of digital technologies for easy availability and accessibility of information to the public.

e) **Mughal Gardens:** It is considered the soul of Rashtrapati Bhavan. It is a 15-acre landscape having over 120 varieties of flora. Mughal Garden is prorated into three parts which are: 1) Rectangular Garden; 2) Long Garden; 3) Circular Garden.

President’s Vision of Rashtrapati Bhavan

India’s 13th President, Shri Pranab Mukherjee did not envision Rashtrapati Bhavan to be merely a pomp reflecting the strong hierarchical colonial order but rather as an institution which demystified its structure and operation. He, therefore, democratized access to Rashtrapati Bhavan as well as took active initiatives to provide better facilities and amenities to the President’s Estate.

Active steps were instituted at Rashtrapati Bhavan to promote easy and equitable access to information and empower the citizens of the country. These steps involved adoption of various e-governance initiatives aimed to provide effective services to its people in an appropriate manner. Some of these initiatives were development of dynamic website of the President of India, Online E-Conference Management System, E-Management

of Visitors System, RFID and Smart Card technology for security, Wifi service and many more.

Journey Towards Smart City Technology

The concept of smart city primarily refers to any urban establishment that utilizes digital technologies to enhance the quality and performance of urban services to deal with the citizens in a more effective and active manner. Its broad areas of focus include transport



Key Areas of Focus under Smart City Initiative



Homepage of Website – www.presidentofindia.nic.in

Rashtrapati Bhavan in a user-friendly and interactive manner. The website also offers exquisite details about various historical and cultural sights of Rashtrapati Bhavan as well as access to its photo gallery and audio-visual library. The President's website has also been integrated with other social media platforms like Facebook, Twitter and YouTube. The platform has been designed to operate with various ICT devices which include Android smartphones and tablets.

c) E-Management of Visitors System (E-MVS): An online web-based platform designed to provide easy access to the people for filing requests to visit Rashtrapati Bhavan. The system offers service in an efficient, transparent and effective manner to strengthen G2C and C2G relations through processing of large number of informational records. The system is integrated to provide SMS and e-mail notifications and can be accessed from any ICT device at any point of time.

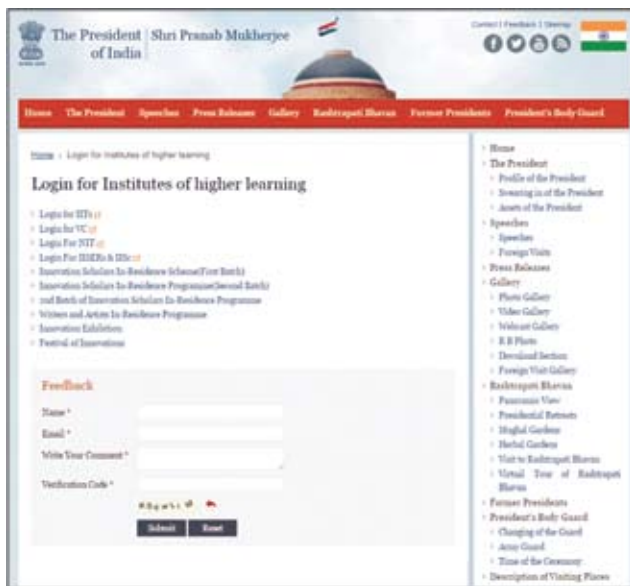
E-Invitation Management System (E-IMS): An online web-based platform which has been designed to create digital invitations for various educational, cultural and ceremonial events taking place at Rashtrapati Bhavan. The system is also integrated to provide SMS and e-mail notifications as well as acknowledgements through digital means. The system offers the advantage of sending requests to regions across NCR. It is a highly cost-effective system and does not require any additional manpower utilization in handling large number of invitations.

E-Presidential Message System (E-PMS): An online web-based

Multiple e-governance initiatives were introduced at Rashtrapati Bhavan from 2012 onwards, aimed at increasing administrative efficiency, optimum management of resources and providing greater satisfaction to the citizens in an environment friendly (paperless) manner. These initiatives were the stepping stones to the broader outlay, i.e., the Smart City Model. Some of the pivotal ICT initiatives introduced at Rashtrapati Bhavan were:

a) Web-Based Platform of President of India: An online website of the President of India which offers all the relevant information about the current President along with details about

b) Online E-Conference Management System: An efficient and user-friendly web-based platform which has been designed to organize annual conference of VCs/Directors of all the central universities/institutions at Rashtrapati Bhavan. The digital platform provides login access to the VCs/Directors to share information about their respective universities/institutions like its goals, achievements and progress reports etc. which can be used as reference for organizing the agendas, discussions, participants and panelists of the future annual conferences.



Homepage of Online E-Conference Management System



Homepage of E-MVS



Process of sending E-Invitation through web based platform



Sample of bar-coded E-invitation



Verification Form of Rashtrapati Bhavan Workman Pass System

platform designed to provide communication with the citizens in a paperless environment. The system offers people to file requests for obtaining messages from the President of India for certain important occasions through digital means. The President's message is shared in a digital format (PDF format) with the people through e-mail and notifications about the filed requests are provided through SMS alerts. The system has been designed to be user-friendly and interactive and at the same time, fast and efficient in the delivery of services.

E-Presidential Function System (E-PFS): A digital platform designed to provide easy access to the citizens to file requests for the President to grace certain educational, cultural and ceremonial events through his presence.



Homepage of E-PMS

The system offers the advantage of easy management of various requests, large in numbers without the need for additional material or human resource utilization. The system has been integrated to provide notifications through e-mail and SMS alerts. The system is highly cost-effective and offers a wider outreach.

In addition to that, the above mentioned digital systems have also been integrated with other useful and effective technologies which reflect the characteristics of a smart city. For instance, all the visitors passes as well as the digital invitations of the guests have been integrated with the barcode technology containing all their personal details which can be accessed easily by any security personnel through barcode scanner having photo features for easy verification. The barcode system also provides scope for efficient management of traffic as well as parking facilities.

Radio-Frequency Identification (RFID) Technology has been adopted under Asset Management Tracking Information System (AMTIS) for the management of all the Presidential gifts as well as the heritage assets and artifacts. RFID technology has been further integrated with Smart ID cards which have been issued to all the residents of the President's Estate for their safe and smooth entry without any compromise on security. Apart from that, RFID technology is also used to ensure easy access and monitoring of all the individuals who are not residents of President's Estate but require access to fulfill certain technical tasks under the

Registration No.	Name of Visitor	Organization	Visit Type	Vehicle Number	Office To Visit	Request Status	Request Booked By
00000001	Mr. X	ABC	Official	XYZ-123	State Office	Approved	00000001
00000002	Mr. Y	DEF	Personal	ABC-456	State Office	Approved	00000002
00000003	Mr. Z	GHI	Official	DEF-789	State Office	Approved	00000003
00000004	Mr. A	JKL	Personal	GHI-012	State Office	Approved	00000004
00000005	Mr. B	MNO	Official	JKL-345	State Office	Approved	00000005
00000006	Mr. C	PQR	Personal	MNO-678	State Office	Approved	00000006
00000007	Mr. D	STU	Official	PQR-901	State Office	Approved	00000007
00000008	Mr. E	VWX	Personal	STU-234	State Office	Approved	00000008
00000009	Mr. F	YZA	Official	VWX-567	State Office	Approved	00000009
00000010	Mr. G	BCD	Personal	YZA-890	State Office	Approved	00000010

Online Visitor's Request Information System Report

Rashtrapati Bhavan Workman Pass System (RBWPS).

Different departments of Rashtrapati Bhavan are utilizing e-office, which is an online digital platform created by National Informatics Centre (NIC) to support governance by ensuring more effective and transparent inter and intra-government processes. It offers different government offices to operate in a simplified, responsive, effective and transparent manner.



Homepage of E-PFS



RFID Scanner to read Smart Cards issued to all the residents of President's Estate



Access to different features of E-Office



Benefits Offered by WIFI Services at President's Estate



RB Smart Change Card Issued to Residents and Officials of Rashtrapati Bhavan

Since it is an open architecture, it offers a reusable framework amenable to replication across different government departments. The E-Office platform offers multiple

features like e-file management system, knowledge management system, leave management system or personnel information management system which can be customized as per the requirement of the department. The Online Visitors' Request Information System has been integrated with E-Office in the President's Secretariat for ease of secured communication.

Online Visitors' Request Information System is a digital platform designed to provide advance intimation to the security control room digitally instead of telephonic communication for enhanced security. The system is also compatible to accept requests from the officials through their registered mobile devices. It offers fast and efficient services without any compromise on security.

All the main departments under Rashtrapati Bhavan have been connected through express WIFI services. The initiative has been further extended to the whole President's Estate. The focus is to provide wireless internet services to the residents so that they can access information relating to education, healthcare, entertainment, banking etc. Apart from that, all the officials and residents of Rashtrapati Bhavan have been issued Rashtrapati Bhavan Smart Change Card which offers cashless mode of transaction to all



RB Bicycles to promote eco-friendly travelling and Healthy Lifestyle



Knowledge Hub at Dr. Rajendra Prasad Sarvodaya Vidyalaya

the services provided within the President's Estate as well as access to RB bicycles to promote eco-friendly mode of travelling and healthy lifestyle.

Rashtrapati Bhavan also offers Smart School facility to the children of residents of the President's Estate. The aim was to transform Dr. Rajendra Prasad Sarvodaya Vidyalaya into a digital knowledge hub through collaboration with Intel India for providing computer skills and knowledge to the students of class 12th. The initiative has brought about transformative educational



Students showcasing their skills in operating Computers and other ICT devices to the President

practices which have helped in empowering children to be knowledge creators for nation building. In addition to that, Intel has also played an active role in training the teachers to enable them to utilize digital technologies effectively. Intel has also offered infrastructure support in terms of providing tablets for teaching purposes as well as introducing electronic display boards at the school.

Rashtrapati Bhavan's Smart City pilot project has also been initiated in collaboration with IBM India. The project involves GIS mapping of the township, its key assets and utility networks. There will be an integration of multiple vertical domains such as energy, water, security and waste management to enhance sustainability and operational efficiency through digital technologies. Already at Rashtrapati Bhavan and the President's Estate, electrical energy distribution is monitored through digital electrical meters. The consumption of electrical power and additional resources like water etc. will be integrated with mobile based data collection software which would provide details like day-to-day consumption pattern as well as its billing. IBM has already started mapping the area of work and is in the initial stage of development. The implementation of this project will help in conservation of time, energy and resources for better and efficient management of assets and infrastructure through digital means.

Advantages

The Smart City initiative introduced at Rashtrapati Bhavan has already garnered a positive feedback because of the various simple yet innovative e-governance systems operating to provide fast and efficient delivery of services. The key advantages the Smart City initiative provides/promotes are:

- a) Paperless form of communication between different departments of Rashtrapati Bhavan and the public in a direct and transparent manner.
- b) Overall effective management of the township.
- c) Sustainable approach towards development through utilization of digital technologies.
- d) Overall increase in the administrative efficiency with optimum management of resources.
- e) Transformation of people from citizens to active citizens and the scope for measurement of citizen's satisfaction.
- f) Optimization of revenue management.
- g) Integration between bottom and top management.
- h) Inclusive participation and habitation
- i) Access to citizen friendly services through relaxation of excessive regulations and greater operational flexibility for effective decision making process. ❑

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Team India Moves Forward- PMs Independence Day Speech-Highlights

- Highlighted the resolve of 125 crore Indians, as "Team India", to root out corruption, and to make India a developed nation by 2022 – the 75th anniversary of independence.
- Highlighted the role of auctions of coal, spectrum and FM radio licenses in removing corruption from different aspects of governance.
- PAHAL scheme for direct transfer of LPG subsidy, which has resulted in savings of Rs. 15,000 crore.
- Introduction of "neem-coated urea" which helped to end diversion of subsidized urea to non-agricultural purposes.
- Important steps taken in the drive against black money; outflow of unaccounted income to foreign destinations checked.
- Financial Inclusion received a big boost with the opening of 17 crore bank accounts through the Pradhan Mantri Jan DhanYojana. The Rs. 20,000 crore deposited in the Jan Dhan accounts reflected the "richness of India's poor".
- Pradhan Mantri Krishi Sinchai Yojana launched with an outlay of Rs. 50,000 crore.
- Welfare schemes launched by the Union Government, including Atal Pension Yojana, Pradhan Mantri Suraksha Bima Yojana, Pradhan Mantri Jeevan Jyoti Yojana; schemes also launched for labour welfare.
- Promise of toilets in all schools almost fulfilled, with the cooperation of States.
- Described children as the greatest brand ambassadors for "Swachh Bharat Abhiyan" - this vision had generated great interest for the people of India.
- Announced the "Start-Up India, Stand-Up India," initiative, which would encourage entrepreneurship among the youth of India. Each of the 1.25 lakh bank branches, should encourage at least one Dalit or Adivasi entrepreneur, and at least one woman entrepreneur.

Sanitation & Solid Waste Management in Indian Cities Through ICT

Kala Seetharam Sridhar



ICT is only a tool, not a substitute, for addressing the substantive problems associated with sanitation and solid waste. The substantive problems are the attitudinal and behavioural approach of the citizens, which need to be modified only with increased education about the negative consequences of open defecation or littering the streets, along with better coordination across service providers, greater fiscal decentralization to local bodies, and the maintenance of more reliable data, to encourage research and make Indian cities free of these problems

Sanitation and solid waste management are basic public services which every citizen should have access to, both for health and hygiene, and for ensuring a good quality of living. Sanitation here refers to toilet facilities, whereas solid waste management refers to the management – collection and disposal of solid waste (as opposed to liquid waste). The image of a city as being clean and free of waste, impacts its desirability for doing business by entrepreneurs and for future residents to live.

As per Census of India 2011, access to sanitation is highly inadequate in the urban areas -19 per cent of urban poor (slum) households defecate in the open; 42 per cent do not have a toilet with flush system. This imposes significant public health and environmental costs to urban areas that contribute more than 60 per cent of the country's GDP. The impacts of poor sanitation are especially significant for the urban poor (22 per cent of total urban population), women, children and the elderly. As per India's National Urban Sanitation Policy, the loss due to diseases caused by poor sanitation for children under 14 years alone in urban areas amounts to Rs 500 crores at 2001 prices (Planning Commission-United Nations

International Children Emergency Fund (UNICEF), 2006). Further, inadequate discharge of untreated domestic/municipal wastewater has resulted in contamination of 75 per cent of all surface water across India. The Millennium Development Goals (MDGs) enjoin upon the signatory nations to extend access to improved sanitation to at least half the urban population by 2015, and 100 per cent access by 2025. This implies extending coverage to households without improved sanitation, and providing proper sanitation facilities in public places to make cities open defecation-free.

The concept note on smart cities by the Government of India (GoI), defines waste management as the "generation, prevention, characterization, monitoring, treatment, handling, reuse and residual disposition of solid wastes", and states that cities which are not clean do not exhibit a smart character. On the other hand, cities which are clean are perceived to be smart.

Municipalities in India are responsible for collection, sweeping, storage, transfer, treatment and final disposal of waste. A study by NIUA (2015) reports that urban areas in India generate more than 100,000 MT of waste every day, with Mumbai contributing 7000 MT, and Bangalore,

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5000 MT. While the Ministry of Urban Development has mandated several management and handling rules for solid waste, most cities and towns are finding it difficult to comply with these rules, keep their streets clean, and safely dispose the waste. An analysis of waste disposal in 22 of India's cities by the Federation of Indian Chambers of Commerce and Industry (FICCI (2009)), as pointed by Sridhar and Kumar (2013), shows that 14 out of India's 22 cities which were studied, sent more than 75 per cent of their waste to dumpsites, indicating a lack of adequate treatment and disposal facilities. Mumbai sends 100 per cent of its waste to dumpsites, while Delhi dumps 94 per cent of its waste.

Thus, the concept note on smart cities acknowledges that Indian cities are facing many issues with regard to waste management, which include:

- Absence of segregation of waste at source;
- Lack of technical expertise and appropriate institutional arrangements;
- Improper collection, inadequate segregation, transportation, treatment and disposal systems.

The concept note states that it is important for a city to offer decent living options, including sanitation and solid waste management of high quality, to every resident. It recognizes the fact that lack of sanitation causes outbreaks of epidemics, health disorders and keeps the mortality rates high in general and among the poor in particular. Further, it is also common knowledge that higher incidences of morbidity forces low income households further below the poverty line. Therefore rightly, the concept note mandates that cities should have a city wide sanitation plan for all parts of the city. Such a plan is expected to be based on a decentralized sewerage and solid waste management system. This concept necessitates that each and every household should have a toilet so that no citizen needs to defecate in the open. Further, to reinforce the requirement at the household level, the mandate is for all commercial and other public buildings to have clean and hygienic toilets.

Further, there is a need for 100 per cent recycling in the sanitation system. The idea is that waste water should not go out of the local area (the concept note provides the example of New Moti Bagh Township in New Delhi), to the extent possible, with only treated water getting into water bodies such as lakes, ponds, and rivers to avoid their further pollution.

In all the policy statements, there is an implicit assumption that open defecation is a practice which is widespread in this country, hence any shots in the dark would target the problem, and get rid of the scourge. However, we are limited in this effort, by the severe lack of relevant data to understand basic questions such as the magnitude of open defecation at the level of the household; what determines the likelihood of open defecation in typical Indian cities; what are the characteristics of Indians who engage in open defecation; and what is the impact of the scale of urbanization on the possibility of open defecation. Analogously, the problem with data on the proportion of solid waste that is collected, remains obscure, and is similar to that in sanitation. Having accepted the limitations of data, the intended results of an effort to get rid of the scourges should be a better understanding of the extent of open defecation and solid waste lying on the streets for want of better management.

There are also several policy-related questions as well which relate to the institutional arrangements with respect to tackling urban sanitation problems in India. For instance, in Bengaluru, there are several actors with respect to sanitation—the local body, the Karnataka Slum Development Board, private contractors and service providers such as Sulabh International, and the state government which has specific programmes to attack the problem. Sometimes, the problem is itself that there are too many actors which makes it difficult to quantify the magnitude of open defecation, which is a constraint for targeting the problem. The case of solid waste management is somewhat better, since it is only the local body which is involved with

this function, some parts of which are typically outsourced to private contractors.

Objective

Given the absence of information required to respond to the menace of poor sanitation and solid waste management, how best can we use information and communication technologies (ICT) to improve the availability and accessibility of, or feedback regarding these services? That is the question this short article attempts to address, using the case of best practices nationally and internationally, and based on secondary data.

ICT is defined by (UNESCO 2002) as everything that includes communication devices and applications such as mobile phones, computers and networks -- hard ware and software, print media, radio, television, the Internet and many others.

There is no reason why Sachs (2011)'s Millennium Villages Project (MVP) which focuses on using ICT in three crucial areas – health, education and infrastructure, should not be applicable to urban areas. In fact, if ICT is applied in rural areas to solve basic problems, there is even more reason to use them to deliver basic services more effectively in urban areas. As pointed by Nyatsanza and Chaminuka (2014), the three aspects –health, education and infrastructure, come as a package, with large economies of scope and scale. Further, with the proliferation of smart phones and the internet, ICT is increasingly being viewed not as a stand-alone intervention, but also as a new way of life and community development.

Nyatsanza and Chaminuka (2014) found out that ICT was useful in empowering women in Zimbabwe, even while many community women lacked skills in the use of ICT, although they were in a position to use mobile phones. Hence, the study suggested that ICT can be used to provide and disseminate information to women regarding the use of safe practices, use of Skype to improve participation and discussion on sanitation-related issues, and installation of tracking devices at

various sanitation points.

If the goals mentioned in the concept note on smart cities of the GoI have to be met, one would need information on available sanitation facilities in the cities/towns in order to assess the demand – supply gap which can form the basis for future planning and rejuvenation of sanitation facilities. As discussed earlier, in most of India's smaller towns, the availability of data (both spatial and non-spatial) on sanitation is a formidable challenge. An initial base map of selected towns in Madhya Pradesh¹ was prepared by Phansalkar (2012) using GIS with the help of consultative process, involving local people/ agency; based on the data regarding various components of sanitation collected through handheld GPS, various thematic digital maps were developed which acted as a base for the planning process. As it should be readily clear, the use of GIS maps helps in continual updating of the base data, and makes the tool dynamic. Further, it enhances our use of relevant data, makes it easily accessible to all stakeholders, ensures awareness and public participation, and monitoring/evaluation of performance in sanitation.

In Nairobi, there appeared to be four main ways in which ICT innovation for improving sanitation was being discussed, as pointed out by Mann et al (2013):

1. Facilitating more frequent and informative discussion between water utilities and their customers;
2. Improving the effectiveness and efficiency of service providers' own internal operations, ranging from mobile payments to meter-reading via smart phone application.
3. Cut-out the 'human element' altogether and focus on fully-automated systems.
4. Using the rapid growth of diverse data sources to permit more effective urban planning and to develop more responsive approaches to service delivery.

In India, ICT is used for the preparation of city wide sanitation

plans. But the lack of widely used city maps is a major challenge, although it does represent an opportunity for many private actors.

Sridhar and Sridhar (2007) report the rapid proliferation of mobile phones in the developing world, which are a cost-effective way, compared with the technology and costs of deploying landline phones. Now with an urban teledensity of more than 100 per cent in India (which means that every person has access to more than one mobile phone), it is indeed possible to solicit responses to the level of the service, using micro-level surveys, for which response by text message may be enough.

The Greater Hyderabad Municipal Corporation (GHMC) has initiated an off-site real time monitoring system (OSRT) which depends on an automatic text messaging system to citizens upon registration of grievances (through mobile phone) and after redressal.²

Given the manual handling of solid waste can be quite inefficient and ineffective, a document by the Ministry of Urban Development (2010), GoI, summarizing best practices, focuses on the use of ICT tools such as GIS location & co-ordinates of bins and dumping sites; GPS enabled vehicles; automatic generation of status (bins picked/ bins unpicked) of collection, providing an online monitoring mechanism; optimizing the shortest path from the collection point to the dumping yard; optimizing the number of collection points and transport of garbage, and so forth. There are several advantages in such an automated system, as the note by the MoUD, GoI, points out:

1. Eliminates the human factor from the entire cycle of SWM process starting from collection to bill disposal;
2. Real time monitoring of the vehicle to improve per vehicle productivity and decrease non-compliance.

The above was effectively deployed by the Pimpri Chinchwad Municipal Corporation, which has reaped the benefits of such a strategy in its solid waste management.

As the case of traffic has demonstrated in Bengaluru, social media such as Facebook, Twitter, can be effectively used as tools to communicate problems regarding solid waste to the relevant organization (typically the local body) websites, which becomes aware of the imminent need to address the problem, and usually does the needful. In some instances, cities have installed CCTV cameras in dumping sites to monitor the activities of waste workers and supervisors. In cities such as Bengaluru, where segregation of waste at source (into dry, wet, hazardous, and others) is mandatory, CCTV camera can monitor those who have been dumping the solid waste in an inappropriate manner, without segregation. Social media tools can also be used as a method of crowd-sourcing ideas from the public and citizens for better sanitation and solid waste management.

As Prabhakar and Mehrotra (2015) suggest, online platforms provide options and alternatives to the user to look into reusing old stuff, instead of discarding them as waste. They also propose sensor-based waste bins for sorting, based on properties of the waste, for collection, to identify the status of waste bins (if empty or filled) so as to customize the waste collection schedule accordingly and save costs. Another long term solution proposed by these authors is Automated Waste Collection System (ACS) which has the ability to replace conventional methods like door-to-door, curb-side, block, community bins collections and transportation via chute system from high rise buildings with waste sucked through pipes; this minimizes human intervention, given the risks of managing solid waste.

Conclusion

While due to the lack of adequate data, the multiplicity of institutional arrangements and urban finances are major causes of sparse good quality research and poor service delivery with respect to sanitation and solid waste management in Indian cities, the ICT revolution has fortunately made it possible to use several tools cost-effectively to solicit citizen feedback in a broad-based manner, which enables

service providers to address them. However, it is best to remember that ICT is only a tool, not a substitute, for addressing the substantive problems associated with sanitation and solid waste. The substantive problems are the attitudinal and behavioural approach of the citizens, which need to be modified only with increased education about the negative consequences of open defecation or littering the streets, along with better coordination across service providers, greater fiscal decentralization to local bodies, and the maintenance of more reliable data, to encourage research and make Indian cities free of these problems.

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Endnotes

1. The four towns were Gwalior, Ashta, Raisen and Khajuraho.
2. <http://www.slideshare.net/CiscoGovernment/ict-for-effective-solid-waste-management-case-study-from-greater-hyderabad-municipal-corporation-by-mr-rajeshwara-rao>, retrieved July 24, 2015. □

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DO YOU KNOW?

OVER-THE-TOP (OTT) SERVICES

The term over-the-top (OTT) refers to the applications and the services which are accessible over the internet, offering easy internet access services to the users e.g. social networks, search engines, amateur video aggregation, music downloading sites and free gaming download web sites etc. They act as an alternative for the conventional service provider. The OTT providers use the Telecom Service Provider (TSPs)' infrastructure to reach out to their customers and offer them products and services. Through this, they not only make money, but also give a tough competition to the traditional services offered by TSPs. These apps also compete with brick and mortar rivals such as e-commerce sites, banking etc. Gone are the days when only desktop or laptop computers were available and used to be connected to the internet. Today, these applications are easily available on the internet and can be directly accessed by the users online from any place, at any time, through a variety of internet connected consumer devices such as a smart phones, tablets, phablets, e-books and even the internet on a smart TV for instant services.

OTT has witnessed an unprecedented growth in the recent years. The major factors for this growth have been the rising penetration of smart phones because of declining prices and unlimited range available in the market to choose from, and the up-gradation of access networks by the TSPs. Digitalization of content has become very common, leading to fall in the level of conservation and reproduction of information and its distribution costs, which in has promoted the explosive growth in the supply of online content. The broadband networks provided by incumbent TSPs are used as a platform by these OTT players for the development of their new businesses. As these OTT applications have increased the online content, there is now an increasing demand for faster broadband speed to cater to this increased data traffic, that needs huge investments in network up-gradation by these TSPs. At the global level, there is an ongoing debate amongst Governments, industry and consumers worldwide regarding the regulation of OTT services. In the wake of this debate, TRAI has also released a Consultation Paper on Regulatory Framework for Over-the-top (OTT) services, that will take account of the views of the service providers, OTT providers and various other stakeholders and related issues (including network neutrality), international experience with network neutrality and regulation of OTTs (communications and non-communications). □

(Compiled by Vatica Chandra, Sub Editor)
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41	- ARJUN SHARMA	184	- RAVI KUMAR	241	- VINOD DUHAN
81	- SHILPA SHARMA	201	- HRIDAY KANT	262	- ANKIT KUMAR AGGARWAL
86	- TUSHAR SINGLA	208	- GAURAV AWASTHI	279	- SUMIT KUMAR JHA
161	- P S SINGH GANPAT RAO	219	- SAURABH GUPTA	281	- NAVEEN KUMAR
169	- GARUD SUMIT SUNIL	230	- VALLURU KRANTHI	296	- CHANDRIKA BHARDWAJ.....

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SHILPA SHARMA (AIR 81) IN CSE 2014.



HER EARLIER SUCCESSFUL ATTEMPT WAS AIR 259. IN CSE 2013

WE CONGRATULATE
PATIL SANGRAMSINGH GANPATRAO



FOR SECURING
161 RANK IN CSE 2014

WE CONGRATULATE
GARUD SUMIT SUNIL



FOR SECURING
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WE CONGRATULATE OUR ACHIEVER
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Socio-Economic Welfare Initiatives

R C Rajamani



India, no doubt, is one of the fastest growing economies of the world. It is expected to rank amongst the world's top three growth economies and amongst the top three manufacturing destinations by 2020. The plan agenda of the government truly seeks to achieve this goal.

After it took over power at the Centre in May 2014, the government of India unveiled a brave, new programme of inclusive economic growth and social welfare. The plan envisages enhanced health, nutrition, basic education, especially of the girl child, women and child development. There is a special scheme for the educational needs of children of the largest minority community – Muslims.

The Government has used the two budgets that it has presented so far to unveil its economic and social agenda. The gestation period of development programmes to bear fruits in any substantial and sustained fashion is usually long and patience testing. Yet, the balance sheet of the government after 15 months of its existence is modestly encouraging and gives enough reason for optimism for the future.

The government received parliamentary approval for additional spending of Rs 40,882 crore to finance MGNREGA, the National Food Security Act and the Integrated Child Development Scheme. The bulk of additional funds will go to ICDS that provides free food to 85 million children. The main health department will see its budget rise by 2 per cent, while the budget to fight HIV/AIDS will see a nominal increase. The HIV prevention programme has been suffering funding shortages in several states.

Government will also provide more resources for flagship schemes such as Atal Pension Yojana and also launch their new variants. Social security schemes — the Pradhan Mantri Suraksha Bima Yojana (PMSBY), Pradhan Mantri Jeevan Jyoti Bima Yojana (PMJJBY) and Atal Pension Yojana (APY) — were launched in May with the objective of providing universal social security.

So far, 7.84 crore people have registered under PMSBY, 2.70 crore under PMJJBY and 4.69 lakh subscribers have joined APY. At present, only 11 per cent of the population is covered under pension schemes while only 20 per cent of the people are insured and the government wants to improve the situation by bringing maximum people under these benefits.

Pradhan Mantri Jan Dhan Yojana (PMJDY) has seen opening of 16.73 crore accounts within a year with a total deposits of Rs 19,990.52 crore. Under the PMJDY, the number of zero balance accounts has come down from initial 75 per cent to 52 per cent. As on July 8, 2015, as many as 14.86 crore RuPAY cards had been issued under this scheme to account holders. Also 114 claims were made till July 10, 2015 and 54 already settled.

Under the pension scheme, 4.69 lakh people have subscribed and out of that, 3.48 subscribers have already received their Permanent Retirement Account Number (PRAN). A total corpus of Rs 14.91 crore has been accumulated so far under the scheme.

Education Sector

The highlights of the education sector during the last one year include the establishment of a national digital library, provision of scholarship for differently abled to pursue technical education and connecting institutions of higher education to villages.

A key feature of the new initiatives is a focussed attempt to utilise the modern tools of information technology in the best possible manner. For instance, a project has been taken up to create a national digital library of eBooks and other e-contents on various subjects and topics and another to set up a platform through which highly qualified faculty of centrally sponsored institutions like IITs, IIMs and central universities would offer online courses free of cost.

Government has launched a scheme called 'Saksham' under which the differently abled students will be provided with a scholarship of up to Rs. 30,000 per year to pursue diploma and undergraduate level courses in technical institutions approved by All India Council for Technical Education. A special scheme called Udaan for girl students is a mentoring and scholarship scheme to enable meritorious girl students to transit from schools to technical education without much difficulty. It also aims to enrich and enhance teaching and learning of mathematics and science at Senior Secondary school level by providing free online resources for all.

The recently approved Pradhan Mantri Kaushal Vikas Yojana (PMKVY) is a flagship scheme for imparting skill training to youth, focussing on improved curricula, better pedagogy and trained instructors. The training includes soft skills, personal grooming and behavioural change. A new National Policy for Skill and Entrepreneurship Development has also emerged to cover the entire gamut of initiatives in this direction. The Policy is to lay a roadmap for boosting growth creating quality manpower. It has set a target for skilling 500 million persons by the year 2022.

An integrated education and livelihood scheme called 'Nai Manzil' will be launched this year to enable Minority Youth who do not have a

formal school-leaving certificate to obtain one and find better employment. Further, to show-case civilisation and culture of the Parsis, the Government will support, in 2015-16, an exhibition, 'The Everlasting Flame'.

Make in India

The 'Make in India' campaign was instrumental in promoting the idea of "Competitive Federalism" in the country as states are competing with each to provide a better suited ground for setting up manufacturing facilities. For instance, in far off north-eastern state Sikkim, the government is busy designing a policy based on its organic products to attract investment to set up a manufacturing facility which could produce packaged organic products.

Ease of Doing Business

The government has set in motion a slew of far-reaching economic reform measures. Important decisions include re-establishing the primacy of the Cabinet, dismantling the Planning Commission and replacing it with NITI Aayog, deregulation of diesel prices to stem the oil marketing companies' under-recovery, availing of the abundant food stocks to cool down food prices, increasing FDI limits in insurance and opening FDI for railways and defence and transparent and triumphal conduct of coal block auctions and spectrum allocation auction.

The creation of the National Infrastructure Fund is a mechanism to use the core resources of the fund or leverage it to borrow funds from the market and deploy these to augment investment in infrastructure. The Government has approved a plan for construction of about 1000 km Expressways at an estimated cost of Rs.16, 680 crores on Design Build Finance Operate and Transfer (DBFOT) mode under NHDP Phase VI. Based on the traffic intensity and commercial potential, the project shall be prioritised.

The Union Budget 2015-16 too announced steps towards ease of doing business in India. The budget proposed to introduce a regulatory reform law that will bring about a cogency of approach across various sectors of infrastructure. This will help infrastructure companies that have multiple businesses like ports, power,

roads and airports.

The budget further simplified the procedures for Indian corporates to attract foreign investments. It has done away with the distinction between different types of foreign investments, especially Foreign Institutional Investor (FII) that comes under portfolio investments, and Foreign Direct Investment (FDI). The pragmatic governance approach has ensured that approvals for over 400 projects with investments over \$70 billion have been expedited. This will help expedite the approval of more than 400 projects, with estimated investments exceeding US\$70bn.

Meeting power demand is going to be a gigantic task as more power would be required not only for increased industrial and agricultural activity but also the domestic consumption with improving standard of living and growing middle class numbering over 300 million. The Government, which is spending \$1 trillion in infrastructure development, is expected to spend at least \$300 billion in the power sector in the next five years. Government has embarked upon a massive programme to provide 24 into 7 power across the country by 2019. This means connecting to the grid 1, 25,000 of the six lakh villages in the country. These 1.25 lakh villages have not yet been connected.

Landmark decisions have been taken in thermal power generation, hydel and nuclear power and more importantly in solar, wind and other green energy. Stress has been placed on strengthening of transmission and distribution, separation of feeder and metering of power to consumers. There is a special focus on the North-East region by giving approval to the north eastern power system improvement project and comprehensive scheme for strengthening of transmission and distribution in the north eastern states.

India, no doubt, is one of the fastest growing economies of the world. It is expected to rank amongst the world's top three growth economies and amongst the top three manufacturing destinations by 2020. The plan agenda of the government truly seeks to achieve this goal. □

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The Vision of a Smart City

A K Jain



Notwithstanding the fact that many Indian cities are still abysmally poor, they are the engines of productivity and wealth.

The wealth created by urbanization and innovations in housing, services, utilities and technology lead to improvements in people's lives. It is projected that by the year 2031, 70 per cent of GDP and 70 per cent of new jobs will come from the cities

India is on the path of massive urbanization. From 377 million urban population, living in 7936 cities and towns, it is projected that by the year 2030, 600 million people will live in urban areas and 78 cities in India will become metropolitan (million plus). Although, the cities generate 60 per cent of GDP and 70 per cent of jobs, the state of housing and basic infrastructure services remains awfully poor, impeding sustainability and economy. This haphazard development continues to scar our cities.

Notwithstanding the fact that many Indian cities are still abysmally poor, they are the engines of productivity and wealth. The wealth created by urbanization and innovations in housing, services, utilities and technology leads to improvements in people's lives. It is projected that by the year 2031, 70 per cent of GDP and 70 per cent of new jobs will come from the cities.

Smart City Mission

Smart Cities Mission has been launched by the Prime Minister on 25th June 2015. A Smart City aims to drive economic growth and improve the quality of life of people by enabling local area development and harnessing

technology that leads to Smart outcomes. The objective of the Smart Cities Mission of the Ministry of Urban Development is to promote cities that provide core infrastructure and give a decent quality of life to its citizens, a clean and sustainable environment and application of 'Smart' solutions for inclusive development.

The strategic components of the Smart Cities Mission are city improvement (retrofitting), city renewal (redevelopment) and city extension (Greenfield development), plus a Pan-city initiative in which Smart solutions are applied covering the city. Given below are the descriptions of these models of Smart City development:

- Retrofitting involves the transformation of an existing built-up area into a smart, more efficient and liveable city. For this, an area of more than 500 acres will be identified by the city in consultation with citizens.
- Redevelopment involves the replacement of the dilapidated built-up environment and creation of a new layout with enhanced infrastructure using mixed land use and increased density. Redevelopment envisages an area of more than 50 acres, which is to be identified by Urban Local

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Table 1: India's Urban Trajectory

Year	2011	2031
Population	1210 million	1440 million
Urban Population	377 million	600 million
Cities and Towns	7936	-
Million + Cities	53	78
Housing Shortage	18.76 million units	30-40 million units
Slum Population	95 million	150-200 million

Source : Census of India, 2011 & McKinsey Report, 2010.

Bodies (ULBs) in consultation with citizens.

- Greenfield development will introduce the Smart solutions in a vacant area (more than 250 acres) using innovative planning, financing and implementation tools (e.g. land pooling/ land reconstitution) with provisions for affordable housing, especially for the poor, and to meet the needs of the expanding population.
- Pan-city development envisages application of Smart solutions to the existing infrastructure by the use of technology, information and data to make the infrastructure services better. For example, applying Smart Solutions in the transport sector (intelligent traffic management system) and reducing average commute time or cost to citizens will have positive effects on productivity and quality of life of citizens. Other examples can be waste water recycling, smart metering and better water management in the city.

Smart solutions will enable the cities to act as the engines of growth. The cities which are planned, built and serviced as sustainable and smart, will be more networked, automated and connected with high-quality services and construction. Standardization, automation, intelligent interconnected system of services, transportation, information technology, energy efficiency, bionic controls, simulation, robotics, renewable energy, solar mapping, stereo-lithography and nanotechnology are *de rigueur* of a smart city. It is the manifestation of a new paradigm and a symbiosis of ecology and human functions.

Making Cities Smart

Cities are complex systems which touch multiple agencies, departments and organizations. These have become too complex to handle and operationalise conventionally. New ways, systematic changes, and technology can enhance their efficiency, services and operations. IT in city services and management helps to develop smart solutions to urban challenges, as well as make the life of its citizens more comfortable, sustainable and healthy.

Smart city applies the Information and Communication Technology (ICT) to enhance innovation, learning, knowledge and creative approach, along with enhancing economy and productivity of the city. Smart cities use IT and automation intelligently and extensively for delivery of civic services, offer smart grid solution for energy management, have Intelligent Transport System (ITS), offer smart traffic solutions to avoid traffic jams and congestion, during crisis and emergencies.

The digital infrastructure comprises wireless devices, data centres and powerful analytics to enable the government to provide more efficient services, maintain a low carbon footprint and create a conducive environment for its citizens, improving the quality of life and living conditions of urban areas through State of the Art infrastructure and facilities.

The breakthrough in technology has multiplied the space, energy and time. With the practical applications of microchips, micro-computers, microwaves, nano-technology, etc., the urban services can create a

breakthrough. New forms of energy, renewable energy and recycling are the key concepts in urban services. The network of society, cyber-space, e-topia is changing the familiar borders like inside-outside, private-public, here-there, city-country and yesterday-tomorrow. The world of space and place is characterized by online exchange of information, interactions, dynamic networks and floating nodes.

ICT-Enabled Infrastructure Services

A smart city provides infrastructure services such as water, sanitation, drainage, Solid Waste Management (SWM), sewage, energy and transportation with smart and intelligent networks. A smart city focuses on intelligent computing infrastructure with cutting-edge advances in cyber-physical systems, and innovation support. Since a city is composed of numerous buildings, these also need to be smart and green. By innovation and renewal of existing operations, it may be possible to reduce energy consumption. Integration of major systems on a common network helps optimize use assignment and space configurations, eliminating unused or underperforming space.

The ICT can help in the integration of citizen participation, governance and online consultation over plans and programmes of local development. The smart city concept includes the following:

1. **Smart Energy:** The power demands in cities are growing exponentially, generation of which emits about one-fourth of carbon footprint. Besides action to reduce the power demand, the energy systems need to be smart and sustainable.

For most energy and utility companies, success will be achieved through transforming the utility network, improving generation performance, and transforming customer operations. They are making investments to upgrade the capabilities of the grid and to enable consumers to take

a more active role in managing their energy use via smart meters, connected appliances and web portals. Utilities are installing technologies that improve the efficiency of the grid, developing new capabilities for integrating renewable energy into the grid, and equipment for storing energy, so power can be made available when it is needed.

The resulting smart energy systems will help the enormous energy saving in operating costs and reduce the need to build more capacity. This also helps to anticipate, detect and respond to problems quickly; empower consumers; and help integrate electric vehicles and energy from renewable sources. The term “smart energy” denotes integrated, scalable systems that extend from businesses and homes, through the distribution and transmission systems, backed by the renewable sources of energy. A smart energy system is instrumented, with sensors and controls embedded into the fabric of its operations; it is interconnected, enabling the two-way flow of information, including pricing, and energy across the network. It is intelligent by using analytics and automation which turns data into insights and manage resources more efficiently.

Smarter grids also stand to be more resistant to attack and natural disasters. A next-generation grid that anticipates, detects, and responds to problems quickly has the potential to reduce wide-area outages to near zero, and at a lower cost. Consumers empowered with better information can make smarter choices about how they use energy. By integrating energy from renewable sources like solar and wind onto the grid, overall impact on the environment can be curtailed, and cities can be more self-sufficient in energy.

2. **Smart Utilities:** aim at high quality

water supply, drainage, sewerage, streets, waste management in catering to growing population. For water supply, the ICT solutions such as SCADA system, enable enhanced efficiency and transparency. Similar benefits are available in respect of solid waste management and other utilities. ICT controlled three bins recycling adopt separate bins for trash, recyclable and compost. Collection charges drop as trash drops. Satellite controlled park and lawn micro-irrigation system cuts water consumption and pumping power.

3. **Smart Mobility:** Intelligent transport solutions can provide seamless, safer, efficient and effective management of public transport systems. Similar results are also visible from use of IT in the planning and management of transport infrastructure and services like taxis, autos, goods transport, signaling system, signage, transport simulation, parking, etc.

4. **Intelligent Community Frameworks:** Community facilities such as health, education, recreational and other neighbourhood services need to be planned to the highest standards of leadership in energy and environmental design (LEEDS) as they save energy, materials and emissions. A smart neighbourhood strives to achieve infrastructure efficiency, conservation of water, energy and natural resources.

5. **Smart and Green Neighbourhood and Buildings:** can give energy saving up to 30 per cent, reduce carbon emissions, provide higher efficiency and comfort with lesser energy consumption. The city and buildings have not only to be comfortable, green and efficient, but also intelligent and integrated. Super-insulated windows quadruple the thermal performance of double panes and can be made from the glass in existing

windows. A sensor controlled photo-voltaic cell and smart glass technology save on air-conditioning and high energy cost.

6. **ICT enabled Public Services:** ICT can enable coordination and e-governance, together with sharing the information amongst the various city departments, residents and other stakeholders.

7. **Ecological Pathway:** ‘Smart City’ is a pathway towards ecological, sustainable development. It is an intelligent way to conserve natural resources (land, vegetation, air and water) energy efficiency, waste management, low carbon, public transit and environmental management.

Key service areas and specifics of a smart city which leads it towards sustainability are shown in Table-2.

e-Governance

In any city, there are more than 100 citizen services that require engagement with civic authorities for enquiries, registration, form submissions, payments, grievances, etc. It is a time taking process for the citizen. The availability of e-gateway for citizen service delivery has attracted much attention in municipal governance and bringing out a silent revolution in many city corporations, breaking away barriers of distance, class and gender. The GIS enables any citizen to take photo on mobile and send an SMS to the administration. The dashboard will capture and address the complaint and even escalate the matter to higher authorities, if unaddressed.

Mumbai has 60 layered features of GIS mapping which is geo-referenced and include the following:

- Complaint redressal platform;
- Town planning permission and licensing;
- Water and Property Tax Administration;
- Public works- estimates and payments;

Table 2: Key Service Areas of Smart City

	Key Service Areas	Specifics
1	Energy	<ul style="list-style-type: none"> • Energy networks, smart grids • Smart meters, Smart Buildings • Renewable Energy Grid • Electric vehicles • Power quality monitoring • Energy conservation, efficiency and monitoring • Bionic Controls • Intelligent management/maintenance, MIS
2.	Public Utilities	<ul style="list-style-type: none"> • Intelligent water and sewerage networks with minimum losses and leakages • Intelligent metering, billing and payment • Waste Management • Plug the Non-Revenue Water (NRW) losses • Identifying leaks using non-invasive techniques and advanced analytics, by managing the pressure in the network at pumps and valves, reducing energy consumption.
3	Smart Mobility	<ul style="list-style-type: none"> • Simulation Modeling • Smart Cards • Smart signals, Traffic Controls, Variable Signage, Mobile Enabled Real Time maps/routes, way finding • ICT enabled Traffic Control • Safety and security, Accident monitoring, Forensic Analysis • Infrastructure integration • Maintenance, MIS and Management
4.	Intelligent Community Framework	<ul style="list-style-type: none"> • Guide for Intelligent Community Planning • Education and health infrastructure • Mixed land use, compact and smart neighbourhoods
5	Smart and Green Buildings	<ul style="list-style-type: none"> • Integrated environment measures • Smart building • Building Information Management • City Administration Centre • Environment Management • Technology and Innovation Centre
6	Telecom Network, Public Service and Governance	<ul style="list-style-type: none"> • Land Information System, Digitised Mapping, SDI, Geo-portal, GIS based property records, plans and transactions • On line Building Plan Approval • Broadband Development • Home Automation and Internet Access. • ICT support and training • Business centers for Small Businesses • A networked portal for Public Security System and Safety • Digital Business Centre, Automated Messaging, SMS • Consolidated billing • Climate street • Electronic Trade and Retail Centres • Geo-portal, mobile/e- governance

- Octroi management;
- Birth and Death Certificate;
- Property Registration;
- Land Services and Slum Surveys;
- GIS based Spatial Data Infrastructure.

Rajkot Municipal Corporation has linked several citizen services with mobile. Known as M-governance, the project has been named as RITE, which means Responsive, Intelligent, Transparent and Effective.

The digital systems are increasingly creating an emerging sociology of urban space. It is redefining and imbibing the idea of exclusion and inclusion. The travel smart card is already being adopted for seamless travel in public transport, access to public spaces, payment system/gateway and social services. It also makes redundant to travel to local offices, banks or government departments for public services. Digitized revolution is also helping in adopting innovative and eco-friendly urban practices, such as virtual town hall, security, traffic simulation, property registration, taxation, etc. Smart chips and systems can be embedded almost in every urban service and structure, making them smart and intelligent. These enable self-diagnosis and self-repair. The future is already upon us, and with digital chips getting embedded in a city's epidermal and exoskeleton level and also its connective tissues, cities are increasingly getting digitally scripted and coded.

Safety and security are the emerging concerns in Indian cities, which involve various levels, departments and service agencies. The victims are often tossed from one department to another due to administrative jurisdictions and domains. It is necessary to set up an Emergency Response and Safety Centre as a common platform to provide instant response, rescue and relief to the citizens by coordinated action. Digitisation and networked technology is applied to build up a unified command and information platform, which offers comprehensive emergency services,



Fig-1 Delhi-Mumbai Industrial Corridor

both for natural disasters and man-made hazards, crimes and accidents, providing, Police, Fire, Medical, Traffic and other services and assistance. Disaster resilience comprising six R's- rapidity, robustness, redundancy, resourcefulness, reformability and recoverability is the key to deal with the risks, dangers and disasters.

The smart cities in India should address the needs of the society-poor, women, children and informal sector. They should relate with local culture and climate. More important than international style greenery and glass buildings are the public places, basic health and education facilities, affordable housing, public transit, water supply, sanitation, public toilets, renewable energy and solid and liquid waste management. A Smart city should be inclusive that provides jobs, livelihoods, local economic dynamism and a venue of cultural expression, learning and communication.

Several smart city projects have been initiated in India, which includes a network of smart cities on Delhi-Mumbai Industrial Corridor and GIFT, Gandhinagar. Various State governments are preparing the blueprints for the smart cities, Ananthpur, the new Capital for Andhra Pradesh being the latest.

Delhi-Mumbai Industrial Corridor (DMIC)

The Delhi -Mumbai Industrial Corridor (DMIC) is one of the biggest urban development projects, which is expected to create 24 smart cities (7 Industrial Regional) spanning six Indian states, including Uttar Pradesh, Haryana, Rajasthan, Madhya Pradesh, Gujarat and Maharashtra. The key features of the cities along DMIC include digital planning and governance, compact, vertical development, efficient public transport, technology for smart grids and better management of civic infrastructure,

Figure:2 Master Plan



technology, security and other services have been planned. It is envisaged to become a model of a smart and sustainable city. It will provide a safe and clean environment, and ecological integrity through low energy consumption, smart energy grids, piped gas. Internet gateway, District Cooling System, Pneumatic Waste Management and intelligent bionic systems. Recycling and reduction in wastes will help to protect the natural environment. The city has been planned by East China Architectural Design & Research Institute (ECADRI) and Fairwood Consultants India (Figure-2).

A multi-modal mix of transport systems (MRTS/LRTS/BRTS, etc.) connect the city with Ahmedabad, Airport, Gandhinagar and other cities. Walk-to-work has been used with a modal split of 10:90 between private and public transport. Besides Bus Rapid System (BRT), Metro and electric personal rapid transit systems are planned for intra-mobility.

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recycling of sewage water for industrial use, green spaces and easy access to goods, services and other community activities. This project has the potential to be a benchmark in showcasing smart urban infrastructure and low carbon development in India (Figure-1).

GIFT Smart City, Gandhi Nagar

Gujarat International Finance Tec-City (GIFT) is an upcoming smart city at Gandhi Nagar in Gujarat. It covers 886 acres (359 Ha) of area. It provides high quality physical infrastructure (electricity, water, gas, district cooling, roads, telecoms and broad-band), special economic

zone (SEZ), international education zone, an international techno-park, shopping malls, stock exchange and service units. The Gujarat Urban Development Company Limited (GUDCOL) and Infrastructure Leasing & Financial Services (IL&FS) have established a Joint Venture Company. Gujarat International Finance Tec-City Company Limited (GIFTC) for development of the project. The estimated cost of the project is Rs. 70,000 crores. It will be a globally benchmarked smart city having an ultimate built up area of 85,000,000 sq ft (7,900,000 sq. m), in which state of art connectivity, communication,

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Mobility or Mayhem

*Madhav Pai
Priyanka Vasudevan*



The colossal investment in the Sea Link and other infrastructure for cars, forces us to reassess the value to urban mobility and the impact on the majority of citizens. So the question is, has this approach really eased mobility; or instead, has it given rise to mayhem?

Flyovers, elevated roads, expressways have become common place in our cities. Since 1999, Mumbai has built over 60 flyovers in and around the city with a bid to ease congestion: the Bandra-Worli Sea Link, Eastern Expressway, in addition to the two East-West connectors, Jogeshwari-Vikhroli Link Road and Santa Cruz-Chembur Link Road. The city has already spent over Rs. 20,000 crore to build this infrastructure. To further maintain this infrastructure, the city spends around Rs. 2000-3000 crore almost equivalent to the annual budget of some medium-sized municipal corporations like Ahmedabad.

Looking back to 2009, the inauguration of the Bandra-Worli Sea Link was a highly celebrated occasion. All of Mumbai was proud of the new infrastructure, with a feeling that the city's mobility be transformed in the days to come. What actually turned out was a road that today serves a mere 40,000 trips per day in comparison to the 15 million trips made by Mumbaikars each day. The colossal investment in the Sea Link and other infrastructure for cars, forces us to reassess the value to urban mobility

and the impact on the majority of citizens. So the question is, has this approach really eased mobility; or instead, has it given rise to mayhem?

What's the Demand

Mumbai, like most Indian cities, has predominantly been a city that walks. As per the Comprehensive Transportation Study for Mumbai Metropolitan Region (LEA Associates 2008), walking is the primary mode of transport for 52 per cent of Mumbaikars. The study further indicates the modal split of motorised modes, with 78 per cent using trains and buses. In the case of accessing public transport, data reiterates that the majority of people walk to the train stations.

This is not just the case in Mumbai. In fact, studies of travel patterns from most Indian cities indicate that walking is the prevalent mode of transport. In the case of Chennai, Delhi, Ahmedabad for example, pedestrians comprise almost one-fourth the trips. In smaller cities like Surat, Jaipur and Bhopal, walking makes up to 45-50 per cent of trips.

For those who walk or use public transport to commute, the lack of provisions is further worsened by the construction of flyovers, expressways

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and other arterials. So, when an overwhelming majority of people travel by walking, using trains or buses in Indian cities, the question arises: what value do flyovers and sea links add for the majority of the people?

Travel Demand for Indian Cities

Global experience has shown us that as you build more roads, the demand for space only increases. A prime example of this phenomenon is the I-405 interstate highway in Los Angeles which is one of the longest and widest in the world, and cost the city US\$ 1.1 billion. Five years later, traffic is slower than before the highway existed. It has become the highway with the highest average annual daily traffic in the country. And this isn't far from the truth in most Indian cities. Mumbai's mission to construct flyovers to ease congestion resulted in average peak hour speeds dropping to 11 km/hr today. Despite the notion that the Western Express Highway (WEH) was built to ease movement and access to the airport and the western suburbs, it experiences severe congestion today (see Figure 1). The image below shows the roads below the flyover accessing the Mumbai Airport, severely congested at the north-bound and south-bound roads.



Figure 1 : The WEH was built to ease congestion, but remains one of the most congested parts of Mumbai today

Urban Road Agenda for Indian Cities

The argument isn't whether we need urban roads or not in Indian cities because we most definitely do. The real question is how we should build them within our cities. An Urban Road Agenda for Smart Cities should require that Indian cities satisfy three critical principles for our roads to be successful in addressing urban mobility.

We need more roads to complete the network. Let us consider the 2 million population that lives in the area located between the two bridges that cross over the Western Railway line – the Gokhale Bridge (Andheri) and the Goregaon-Mulund Link Road. To access a wider part of the city, these residents need to cross over the railway line. In seven kilometres of this area, there are 2 connector bridges that allow for crossing over the railway lines. For a city that is sliced in three by its railway lines, the east-west connectors are an extremely critical link to the network. . In accordance with its physical and geographical context, Mumbai has grown along its North-South alignment, with minimal focus on its East-West connectivity. However, without adequate east-west connectors that provide access to the major north-south arterials,

mobility will continue to be hampered significantly.

In comparison, a city like Ahmedabad, which is also divided in two by the Sabarmati River, has over ten bridges to facilitate the movement. The inner and outer rings are complete, and the network is fairly good and complete, as seen in Figure 2. A classic indicator of a fairly well-established network is the average trip length of 5 kms in Ahmedabad.

Bengaluru, on the other hand, has an average trip length of around 9 kms. The city has major arterials (indicated in blue in the image below) - Richmond Road, MG Road, and Residency Road - that run from north to the south, travelling through the centre of the city. One has to travel through the most congested parts of the city centre to reach their destination. These roads have been transformed into fast-moving thoroughfares, where no one wants to live. Businesses too are gradually moving away from this type of environment that is un conducive to development. To complete its network, Bengaluru needs an inner ring road that will provide multiple options for improved mobility.

The second principle is to multiply the capacity of the road network. To achieve this, there are some common short-term measures that can facilitate the situation. First, improving signal coordination and programming signals for varied demand. Travel patterns vary through the day and week, i.e. through morning peak, non-peak, afternoon hours, evening peak periods. Programming signals according to the variations in demand will improve mobility management. Using technology for signal coordination will provide more weight to the green signals for the heaviest traffic movements, than the smaller movements and in real-time.

Another short-term measure is the elimination of on-street parking. When compared to national subsidy



*Figure 2: Ahmedabad's road network provides for good connections
(Image Credit: Prof. Shivanand Swamy)*

programmes like the National Rural Employment Guarantee Act (NREGA), parking is one of the largest subsidies given to urban dwellers. On-street parking greatly reduces the road capacity and traffic flow. To prevent this, over the last decade, Mumbai has urged developers to construct parking facilities across the city. However, the availability of free or low-cost and unmanaged on-street parking has made these facilities redundant. Strict enforcement of on-street parking will mean that people will begin to use the pay-and-park facilities and avoid on-street parking, freeing up much-needed road space.

A third measure is to maintain contiguous road width to facilitate smooth traffic flow. City roads are often taken over by common roadside activities like informal vending. Better management of these activities and enforcement to prevent road encroachments will free the roads of obstructions, allowing them to function as thoroughfares.

These short term measures will result in minimum mobility improvements for the city. For our space-hungry cities, it is of utmost importance that every road we build be used to its optimum capacity.



Figure 3: Bangalore's major arterials ensure travel through the most congested parts of the city centre (Image Credit: Prof. Shivanand Swamy)

As directed by the National Urban Transport Policy (NUTP) that means to facilitate the movement of people rather than vehicles. The really significant improvements will come from multiplying the capacity by increasing throughput. In other words, mobility can be improved by increasing the throughput of people, rather than that of vehicles through the implementation of Bus Rapid Transit (BRT). Mexico City's BRT Metrobus clearly illustrates how the city was able to restructure and reorganise road space to use it more efficiently. The road was a 3-lane arterial, carrying roughly 2000 persons per hour per lane – a total of 6000 persons per hour in one direction. In 2005, Metrobus Line 1 was constructed along the Avenida de los Insurgentes, a north-south arterial that traverses through the heart of Mexico City. By allocating one-third of the road space to the BRT, the capacity was drastically increased to an additional 15,000 persons per hour in the BRT lane (see Figure 4). This was implemented on 30-40m wide roads, similar to road widths in India. Essentially, the best space on the roads, i.e. the high-speed median lane, was barricaded for the biggest vehicles, carrying the most number of people.

This multiplying of capacity is not just needed on arterials, but across the road network to scale up the intensity and increase capacity. Every urban arterial in Indian cities needs to have BRT. Over the years, the Metrobus has successfully scaled up and now operates 105 kms of BRT on the city's major arterials, with a system ridership of 900,000 per day. The key to a comprehensive BRT system is that it should include a



Figure 4: BRT like the Metrobus in Mexico City, can significantly enhance road capacity

series of features that increase system efficiency:

- Level-boarding to maintain low boarding and alighting time
- Closed, dedicated stations
- Safe pedestrian crossings
- Large (high capacity), comfortable buses
- Automated fare collection at stations to omit boarding time spent on purchasing a ticket
- A powerful, well-branded image

Implementing technology as an enhancement to the BRT will also have significant impacts on the number of persons carried. A key impediment of BRT is the intersection delay due

to external traffic conditions. Signal priority such as intelligent traffic systems help minimise the effect of the intersection delay. Vehicle detectors are used to identify bus arrivals at the intersection and expedite the green phase of the signal at this time. The Indore BRTS uses a wireless traffic signal system to adjust signal phases and prioritise buses.

Examples from Indore and Ahmedabad have indicated that this is very practical even in the Indian context. The iBus in Indore incorporated all elements and now operates a full BRT system (Figure-5). The system runs on segregated busways, includes stations with prepayment and level boarding, a centralised control system, comfortable



Figure 5: In Indore, the capacity of a single BRT lane is vastly more than the two lanes of general traffic

buses with large doors, and a distinctive image that people relate the system to. As seen in the image below, although the segregated busways look empty, each bus transports the equivalent of 70 cars – the point to remember is that there are significantly more people in these buses than in the cars. The 11 km corridor in the centre of the city recently crossed 50,000 passengers per day.

The third principle is termed as the 40:40 principle – all roads inside a city should be designed to operate below 40 km/hr and less than 40 m wide. Studies have found that a speed limit of 30 km/hr significantly reduces the risk of fatality (Rosen and Sander 2009). An advertising campaign for road safety launched in New York City appropriately explains the difference in speed limits and the effects on pedestrian safety (see Figure 7). When a pedestrian is hit at 40 mph (64 km/hr), there is a 70 per cent chance they will survive; when they are hit at 30 mph (48 km/hr), this increases to an 80 per cent chance of survival. Safer vehicle speeds have a great impact on road fatalities and streets should be designed to ensure a speed limit.

Accident data from Indian cities and cities around the world indicate that pedestrians are the most vulnerable road users and they comprise the most number of fatalities. Further investigation shows us that a significant number of these accidents take place at intersections and at mid-block crossings. This indicates a clear requirement to focus on roads that pedestrians can cross, rather than wider footpaths. Streets should not be designed with open, wide intersections that force pedestrians to transform into an Olympic runner to cross in time. Streets need to be easy to navigate for the common pedestrian. Smaller intersections, narrow roads that are easy to cross, and mid-block crossings that provide the shortest and most direct path can easily be designed on a less than 40 m road.



Figure 6: New York City reduced its lane widths from 3.5 m to 2.75 m to prevent speeding

We need to question the usability of our roads. Can an 80-year old cross the road in a comfortable manner? Would we allow an 8-year old child to cross our roads unsupervised? Well-designed roads are accessible and easy-to-use universally, by the old and the young who make up the most vulnerable. A road width of well within 40 m can successfully achieve this. Experience from New York City indicates that reducing general traffic lane widths from 3.5 m to 2.75 m can minimise speeding, as illustrated in Figure 6. Two lanes of 2.75 m in each direction will equate to an 11 m roadway. An additional three lanes of 3.5 m each (two lanes in each direction with an overtaking lane) is required to facilitate the high speeds and high throughput of the BRT. A further 10 m space designed for pedestrian footpaths and cycle tracks will complete the road section. Essentially, a very good level of traffic

can be accommodated within a 32 m wide road, with the implementation of BRT lanes, which will increase the number of people moved.

Similarly, smaller inner streets can be designed as a 20 m wide road with a speed limit of 20 km/hr. Neighbourhood streets of 10 m width designed for 10 km/hr are environments where cycles, people, and cars can co-exist safely. It is important that the speed isn't managed through the placement of speed posts specifying the limit or cameras. Instead, we must design roads that ensure the desired speed – the design speed. This can be achieved through urban design elements such as barriers, chicanes, lesser kerb radii, and reduced lane widths that slow down vehicle speed, and protected footpaths and bicycle lanes that safeguard vulnerable users.



Figure 7: New roads like the JVLR in Mumbai have ignored the principles of increased capacity and equitable distribution of space

Urban design can also reduce the troublesome pedestrian crossings that force people to dart across and dodge vehicles. Pedestrians are often seen dodging cars. Wider streets should be designed to minimise the need for pedestrians to run across. The use of pedestrian refuge islands, bulb-outs, direct and shortest crosswalks will facilitate safe pedestrian movement.

Street design has changed as a science, from highway-centric designing to building for people. Design manuals being launched by cities like New York have shifted their focus to the equitable distribution of road space. From July 2006 to June 2009, New York has constructed over 200 mi (320 kms) of bicycle tracks. In Delhi, the UTTIPEC design guidelines also conveys some good practices in street design; however, we are yet to see how this translates into implementation. The Indian Roads Congress (IRC) 103 provides good detailing on footpath design, the use of bollards and other traffic-calming measures. The manual includes street design elements appropriate to the context, rather than focusing on roadway design guidelines.

Urban streets in India are the biggest public spaces. There has been a growing interest in building roads. In Mumbai, we built the Jogeshwari-Vikhroli Link Road (JVLR) and the Santacruz – Chembur Link Road (SCLR), much-needed east-west connectors. However, where are the outcomes of principles 2 and 3? We built long roads that dismissed the needs of pedestrians, the majority of users (see Figure 7). As a result, they are forced to transform into high-jumpers and sprinters to safely use the road. We need to actively work to make sure roads like this don't get built in our city and designs follow the principles laid down in the agenda.

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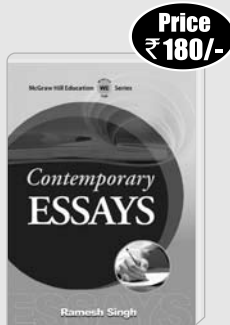
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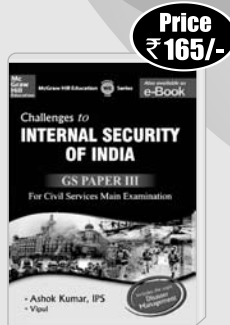
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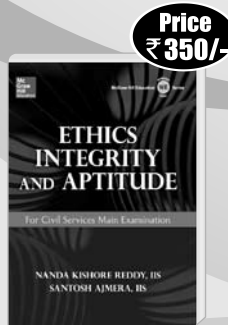
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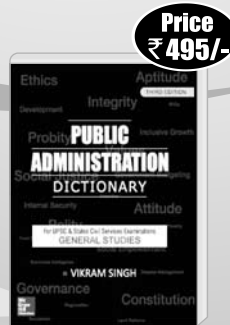
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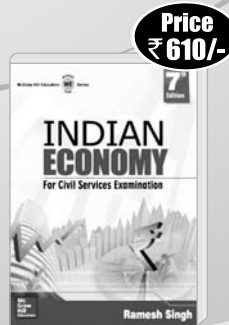
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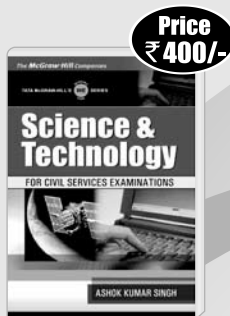
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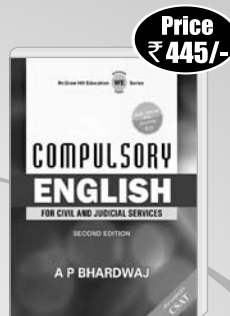
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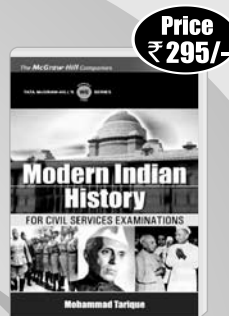
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Implementation Strategy for Urban Rejuvenation Mission

Rakesh Ranjan



The key task of urban managers of a smart city is to foster rural urban economic linkages in general and ensure basic amenities including affordable public transport in peri - urban areas which have hitherto remained neglected but have emerged as zones of intense economic activities. This would result in synergistic growth of rural and urban India

Why does reform of urban governance structure hold key to success of Urban Mission? On June 25, 2015, India launched its much awaited Urban Rejuvenation Mission. Briefly put, the Mission intends to assist the State Governments in creation of 100 Smart Cities; rejuvenate 500 class-I cities; ensure housing for all by 2022, make India clean by 2019 and restore heritage centres. It has raised expectations as many saw the Mission, especially its ‘Smart City Programme’ as something new and an expression of the aspiration of the country to leapfrog its problems by using modern technology.

Organized by NITI Aayog in collaboration with Institute for Human Development and University of Florida¹ at a conference, on sustainable and inclusive urban development in India, Urban Rejuvenation Mission became one of the dominant themes. If one has to summarise, following closely related questions were asked:

- a) What are the deliverables of a smart city in India, especially in the context of efficient urbanisation being a critical pre-requisite for a rapid, more sustainable and more inclusive economic growth?
- b) More importantly, whether there are any processes issues or unfinished tasks that the policy makers and implementing agencies need to

address quickly to ensure successful implementation of the Mission?

This paper is an attempt to briefly answer these questions. It concludes that Central Ministries have done well to incorporate one of the major learnings of JNNURM: not to micro-manage a project from the Centre and give larger decision making powers to State Governments. However, much would depend on State Governments in defining the contours of Smart Cities and efficient urbanisation in India and the success of its implementation would be critically dependent on willingness and ability of States to further devolve powers to city governments- a process that was initiated under recently concluded India’s flagship urban programme: the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) but has remained incomplete.

A few caveats are in order. Firstly, efficiency in delivery of civic amenities affects our lives in many ways and there are many equally valid perspectives on what should be the objectives of a smart city. For brevity, they may be categorised falling under three² broad streams: a city is smart if (i) it ensures that it uses positive agglomeration economies for attracting investment for expansion of economic enterprise within the cities, provides basic amenities to all at affordable rates and takes advantage of the strengthening rural urban linkages (ii) ensures that it is aesthetically built and ensures good

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quality of life due to creation of public spaces etc. and; (iii) ensures that its energy footprints are optimised and its exchange with physical environment remains sustainable.

Smart Cities: Inclusive Economic Growth

An efficient urbanisation matters on many counts. Firstly, despite a significant reduction in share of agriculture and allied activities in India's GDP from 51.45 per cent in 1951 to about 16.82 per cent in 2014-15, per cent of labour force employed in these sectors has shown almost an occupational stasis, decreasing from 70 per cent to only 54.6 per cent in the same period. For a rapid inclusive growth, a core imperative is faster creation of remunerative employment opportunities in non-farm sector.

The 12th Plan correctly argues that notwithstanding an impressive growth rate in farm sector in recent years, potential of creation of gainful livelihood opportunities in services and manufacturing sectors remains much higher. Since spatially, these sectors are largely urban, it implies that efficient urbanisation is a necessary pre-condition for inclusive growth.

However, the above assertion, while largely valid, needs to be somewhat qualified if one notes the emerging trends in urbanisation in India. Firstly, contrary to popular perception, there is *as yet no evidence*³ of any significant acceleration of urban population in India, though the last decade witnessed a marginal rise in Annual Exponential Growth Rate (AEGR), which increased from 2.73 per cent in 1990s to 2.76 per cent during 2001-2011, but still is much lower than 3.8 per cent of 1970s. Secondly, and again, contrary to widespread beliefs, rural-urban migration has remained muted. A very significant part of growth is accounted for by emergence of what are called 'Census' towns which are such agglomerations that grow in rural and peri-urban areas and are yet to be notified as urban areas. Thirdly, there is indeed some evidence⁴ of creation of non-farm employment in rural India.

India's rural sector is unmistakably undergoing a transformation due to variety of factors including high agriculture growth rate, especially in the 11th plan period; high level of remittances- domestic as well as foreign, and significant fund flows in social sector government schemes like MGNREGA, Pradhan Mantri Gram Sadak Yojana, National Rural Health Mission, Sarva Shiksha Abhiyaan, Integrated Child Development Schemes etc.

What conclusion can be drawn regarding the nature of the task that our urban rejuvenation mission needs to accomplish? Firstly, if urban India generates around 63 per cent of India's GDP and yet rural urban migration remains muted, this shows that our cities are yet to become inclusive. Urban Managers in any smart cities, therefore have the following specific tasks: time has come when India draws a specific pro-migrant policy if it has to ensure that its growth process is broad based and inclusive as embodied in the slogan given by the Prime Minister: *Sabkaa Saath, Sabkaa Vikas*. Even with some shift away from farm employment in rural India, it is nobody's case that India can emerge as a strong nation with half of its workforce remaining engaged in agriculture and allied activities which contributes only around 17 per cent of GDP. Secondly, they have to expand supply of basic amenities to cater not only to the existing population, but also prepare the city for anticipated higher number of migrants who are mostly poor with limited paying capacity.

In addition, emergence of census towns is a pointer to a trend that much of the Indian inclusive growth story may be written in medium towns and peri-urban areas surrounding million plus towns. The key task of urban managers of a smart city is to foster rural urban economic linkages in general and ensure basic amenities including affordable public transport in peri - urban areas which have hitherto remained neglected but have emerged as zones of intense economic activities. This would result in synergistic growth of rural and urban India. An important

task here is to create mechanisms for information exchange to enable an unorganized labour and the prospective employer to negotiate directly thereby reducing the role of middlemen who, at present, appropriate a significant part of wages as agency commission.

It is concluded that in the true sense, creation of smart cities involves careful assessment of its growth potential in terms of its endowments, location and its interaction with its surroundings on one hand and drawing realistic plans and committing resources to realize its potential on the other. Creation of a conclave of excellence as an engineering project with the help of modern technology to attract world class business may be one of the strategies but seldom the dominant one. It is for this reason that the scheme architecture of smart cities allows the States and cities to choose different models of smart cities and the programme is launched in conjunction with Atal Mission for Rejuvenation and Urban Transformation (AMRUT) – a programme for upgrading infrastructure in 500 cities and Housing for All by 2022, which aims to encourage affordable housing segment with basic services like water, electricity, sanitation, broadband etc.

Implementation: Unfinished Tasks and Challenges

The challenges of urbanization in India are fairly well⁵ documented and for fuller collation, interested readers may refer to the 12th plan.⁶ To summarise, Indian cities have a fragmented governance structure with no clear delineation of responsibility and accountability, Urban Local Bodies (ULBs) or city governments which are in the driving seat in managing cities in most smart cities in the world - are institutionally and financially too weak in India to handle the task, neither they have been strengthened to do so in future; investment requirements of infrastructure are astronomically high while city governments have no road map for either generating such resources, nor improving their capacity to execute projects even if funds are available as transfers from State/Federal Governments. There is adhocism as urban plan remains one of

the weakest links in city management. There are other deficiencies like capture of city government by articulate middle class or urban elite, rendering little space for urban poor. In addition, the land use remains woefully divorced from market realities and transport plans.

Fortunately, none of these challenges are insurmountable and if other countries have addressed them, there is no reason as to why we cannot. As stated above, JNNURM had started in 2005 on an ambitious note and a well-thought strategy: it mandated 23 urban reforms, mostly aimed at improving the urban governance structure and linked federal assistance to States to completion of these reforms.

These reforms were based on a careful evaluation of what has been the gap areas in Indian urban governance structure and how to address these limitations, their focus areas being: Empowerment of city governments and strengthening of their financial position; improvement in city level planning for more efficient land use for sustainable growth; ensuring delivery of basic amenities to urban poor; encouragement of private participation in city level projects; removal of distortion in the urban land market and ensuring community participation and bringing transparency in governance.

An immediate contribution of JNNURM was to indicate the direction in which one should proceed. It indeed mainstreamed *at least* discussion on urban reforms and many States and cities made substantial progress in initiating these reforms. However, let us briefly mention the continuing nature of this challenge:

Firstly, Indian city governments are not only woefully deficient in number of staff per lakh population in comparison to cities like New York or London, the teeth-to-the-tail ratio of municipal cadres is also very adverse. While a standard advice from Central Ministry is to recruit municipal cadre, the key issue is how to find salaries for such a large number of additional staff when municipal governments are struggling to give salaries to their existing staff.

An argument is made that recently, the 14th Finance Commission has substantially raised grants to ULBs and that can be used for municipal cadres. However, these grants, as per a rough calculation, turn out to be only about Rs. 4.3 cr per municipal body annually on an average and the Finance Commission has also advised the ULBs to use these grants on basic amenities.

A closely related challenge is the lack of viable institutional structures to ensure that city governments are participative. While the implicit assumption in giving prominence to elected representatives the management of cities in 74th CAA is that being more accountable to people, they would ensure urban planning to reflect the needs of the people and projects would get prioritized accordingly. However, the urban sector has seen mushrooming of civil societies and NGOs, clearly indicating that a larger section of urban population repose their faith in these bodies instead of the elected urban representatives.

An immediate contribution of JNNURM was to indicate the direction in which one should proceed.

Another closely related challenge in urban governance is the lack of convergence of schemes/ programme at municipal level. For an ordinary citizen, it makes immense sense if municipal governance is a single window interface on Governance related matters. However, presence of parallel Departments in State Governments and parastatals has prevented municipal bodies to undertake this role.

Yet another issue preventing municipal bodies to take centre stage is the uneasy relation between experts and elected bodies. Management of cities like urban planning, running of urban transport projects like metro rail, planning of sanitation and water supply projects are indeed technical stuff and importance of experts in city governments can be ignored only at a peril. However, ensuring accountability of city managers to people is an over - riding imperative especially

if resources are scarce and projects are to be prioritized. Experience, elsewhere in the world has shown that in the long run, accountability to people is best ensured when elected representatives are empowered. What should therefore be the relation between experts running Delhi metro rail and municipal bodies of Delhi? Who should decide metro alignment? Land use pattern in Ahmedabad or in Delhi? Expert led Ahmedabad Urban Development Authority or Delhi Development Authority or respective Municipal corporations? These are indeed difficult questions.

Another important issue which directly affects the programme for housing for all is the lack of control of Municipal bodies on urban land as generally they are managed by Development Agencies like DDA and AUDA. Hence, while slum rehabilitation and ensuring housing for all remains the responsibility of Municipal Governance, land which is required for these tasks are controlled by another entity.

The scheme architecture of AMRUT as well as Smart cities projects correctly mandates that cities would make plans. The unfinished task here is that States/ Cities are looking forward to a broad template to make a plan which is technically robust on the one hand and involves participatory planning technique on the other, which is by no means, an ordinary feat. Absence of development of broad template has the danger of a plan made by consultants with no ownership from either the ULBs or State Government as was the case with many City Development Plans under JNNURM.

Recommendations

- a) There is an immediate requirement of bringing urban governance related reforms, focusing on implementation strategy of Urban Mission. To address the problem of shortage of quality staff, in the short and medium term, Ministry may create funding arrangements for ULBs to hire resource personnel from markets as creation of dedicated municipal cadres is an expensive and time consuming process and is a feasible strategy



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Smart Cities : Keeping them Secure and Disaster Free

R K Bhasin



Public safety and security has become paramount for city administrations. This covers protection against crime, natural disasters, accidents or terrorism. The safety is no longer restricted to street violence but takes into account financial offences, cybercrime, data breaches/ theft etc

The focus on “Smart Cities” by the Prime Minister has been quite vocal ever since he took charge of the government. He has announced that his Government will initiate the process of building 100 Smart Cities for which an allocation of Rs. 7060 Crores has been made in the current year’s budgetary proposals. Some of the existing medium-sized cities will be identified by the National Sustainable Habitat and Smart City Mission (NSHSCM) which will be a driving force for these projects.

As we know, the trend of urbanization is here to stay. For every nation, cities act as the catalyst for growth and India is no different. As per the latest Indian Census of 2011, about 31 per cent of the population lives in urban areas and it is expected to go up to 40 per cent, with GDP contribution of nearly 75 per cent of the national GDP in the next 15 years. When referenced to global experiences, a country’s urbanisation beyond the 30 per cent happens at a much faster rate. This puts India on an inflexion point – which caveats urban decay.

The need for investing behind infrastructure (of all kinds) is thus, critical to magnify development potential and arrest decline. In sync

with the need and a vision for the future, the Government of India has set up the task of development of 100 Smart Cities in the country.

What is a Smart City?

Given the vision it is, there have been various ways in which a Smart City has come to be defined. There is no standard definition. However, some of the versions include:

The US Office of Scientific and Technical Information defines it as “*That monitors and integrates conditions of its critical infrastructures, better optimize its resources, plan its maintenance activities, and monitor security aspects while maximizing services*”. The Department of Business Innovation & Skills, UK defines it as, “*a process, or series of steps, by which cities become more “livable” and resilient and, hence, is able to respond quicker to new challenges. Thus, a Smart City should enable every citizen to engage with all the services on offer, public as well as private, in a way best suited to his or her needs*”

Broadly, when looked at from the perspective of implementation, a Smart City should leverage the existing traditional and complement the modern to enable a better standard of living, sustainable development and better management of resources.

The author is Secretary General with Federation of Industry Trade and Services. He served in a nationalized bank as Chief (HRD). Thereafter he has been associated with well known national Chambers as Joint Director (Projects) looking after councils on Homeland Security including Cyber Security, IPR, Legal, Warehousing, Banking and Finance & Insurance.

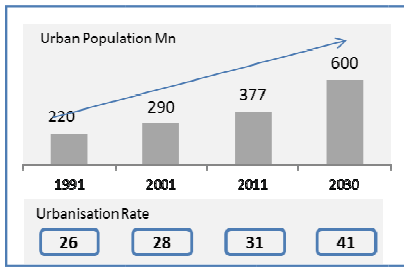


Chart 1 : Rising Urbanization

Framework and Salient Features

Under the broad guidance of Ministry of Urban Development, an integrated framework with three key enablers could be referred to as the model of implementation. This highlights the key components that are critical to define a smart city, along with the infrastructure enablers that can help ensure delivery of the same.

The smart city ecosystem is a broad partnership between the public and private sector (PPP). City planners and developers, non-governmental organisations, IT system integrators, software vendors, energy and utility providers, the automotive industry, and facility control providers, as well as technology providers for mobile technology, cloud computing, networking, Machine-to-Machine (M2M) and Radio-Frequency Identification (RFID), all have a role to play, including the community.

The point of keeping cities secure and disaster free are partly covered in sustainability and quality of Life. Let us look at probable modalities to ensure

the cities are a) Disaster Free and b) Secured.

- Public Safety & Security :** Public safety and security has become paramount for city administrations. This covers protection against crime, natural disasters, accidents or terrorism. The safety is no longer restricted to street violence but takes into account financial offences, cybercrime, data breaches/ theft etc.

Herein, the role of Tele-surveillance systems gains credence and coupled with real-time communication capabilities, it can help intervention at the time of an emergency. Starting from gathering and analysing intelligence data, sharing information between agencies, operations of a smooth tele-surveillance systems to ensuring connectivity to response teams in the wake of an emergency situation, all provide for an environment to create safety for the citizens and infrastructure.

Some of the mechanisms and interventions to allow for a safe and secured city may include:

- Tele-Surveillance:** It is critical that the systems maintain their availability round the clock and in times of an emergency it can then be relied on to obtain directions and instructions from operational control centres. The surveillance

also acts as a deterrent for petty crimes, and a rich source for intelligence inputs. It is also important that this data and visualization be accessible on any screen in any location, whether via smartphone, laptop, or a police cruiser terminal.

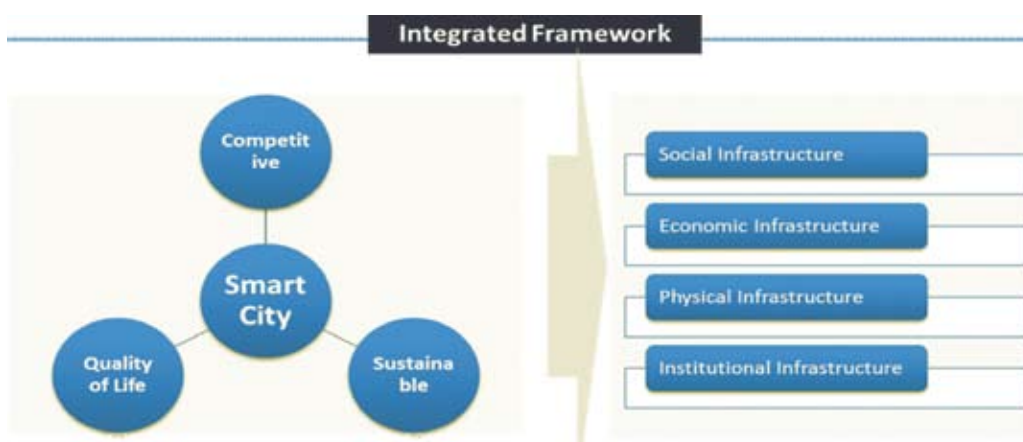
- Data Integrity :** Designing and building encryption solutions into devices ensures that they can only communicate with the required control centre and communications can be authenticated. However, integrity will mean the data is encrypted to manage data sharing over unsecured lines. Digital certificates can also be used for authentication, signing and encryption. There are algorithms available currently in the research community that can be used to maintain anonymity while reaping the benefits of sharing data dynamically.

- Collaborative Response Efforts :** It is essential to have infrastructure that allows organizations to take action in one system based on data coming from another – for example, if a system indicates that a vehicle is stolen, it should automatically marshal nearby cameras to capture video of the driver. The best systems also enable collective action – in this same scenario, once the vehicle is identified, alerts should go out to all nearby police officers who then work together based on their shared information. Or

when a citizen seeks an ambulance service, the data should be fed to all traffic signals to turn green upto the nearest hospital.

- b) Disaster Free :** Smart Cities are not only about providing comfort, but also minimizing the impact of natural disasters. This requires smart urban planning and constructing buildings resistant to natural

Chart-2



disasters. In addition, the cities will have to develop new energy efficient means, improved drainage and purification systems for air, water and soil to reduce stress on natural resources. The focus will shift towards modular and autonomous small dwelling units that have all the essentials a person may need during several weeks. Restoration devices and new inventions like 3D printing could have a big role going forward.

Some of the simpler means to ensure disaster free smart city may include:

- **Ensuring Connectivity Round the Clock and Year:** Technology can play the role of a unifier in cases of emergency. Online disaster rescue themed communities could be built and made aware of to be accessed in times of specific disasters. For example, Google introduced its Project Loon that uses high up balloons to give access to Wi-Fi to people in remote places in times of disasters or just in poor regions. The project is soon to enter the second phase after testing the balloons in certain parts of the globe.
- **Disaster Resistant Hubs:** Creating resilient and sustainable communities that will also provide alternative energy in the times of natural disasters. These helpful hubs will be used for collecting solar power, rainwater and for waste composting.
- **Modular Housing Solutions:** These can be set-up as relief camps in times of need. These include basic facilities like kitchen, bathroom and sleeping spaces.
- **Data generated from Smart phone:** Data generated by smart phones and sensors in the infrastructure can lead to better responses to natural disasters. For example, in the event of an earthquake, rescue teams can be alerted to victims by tracing signals from implanted medical devices or sensors. The smart phones will amplify the signals from the sensors, and the rescue teams can track the signals. Or another example, a subway platform that has sensors embedded to monitor and flag overcrowding. As they sense the platform reaching capacity, the sensors automatically alert police and transportation officials, who can take action by sending buses to the station as an extra means of transportation.

The need of the hour is to make the isolated functionary to start cooperating in sharing data and create a coordinated cell across all ministries that will oversee this coordinated effort.

Sustainable is possible only when physical and virtual links are created between things and agencies which didn't exist before. Technology will have a role to play and will transform the way we consume all the information from our ecosystem. This will also help bring transparency and ward off evils of corruption, thereby improving business and the quality of life for regular citizens. It will be a step by step process which has begun by the recent earmarking of funds against the Smart City Initiative. The investment will need to be backed by effective implementation to truly harness the potential of the initiative. □

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