

REVIEW AND TECHNIQUES OF SMART CITY

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Abstract: Making a strong pitch to consider urbanization as an opportunity to mitigate poverty and not as a problem, Prime Minister Narendra Modi today said cities have to be strengthened through comprehensive and inter-connected approach combined with increased public participation.

Index Terms –Smart city development, Urbanization, Smart Technologies

I. INTRODUCTION

It's a city outfitted with high-tech communication capabilities. It uses digital technology to enhance performance and wellbeing, to reduce costs and resource consumption, and to engage more effectively and actively with its citizens. The buzz about smart cities are catching up. Where 8 years back the people were talking only about smart phones, through a series of parallel technological developments globally the concept of smart cities is rising. The idea of smart city came into formulation owing to the need to accommodate rapid urbanization of the age. Interest in smart cities continues to grow, driven by a range of socioeconomic and technological developments across the globe. It is due to the increasing number of smart cities that established suppliers from energy, transport, buildings, and government sectors are moving into the smart city market, while start-ups are addressing a range of emerging opportunities in the same field. The report examines the strategy and execution of 16 leading smart city suppliers with the capacity to provide leadership on large-scale smart city projects spanning over multiple operational and service areas. These smart city suppliers are rated on 10 criteria: vision, go-to-market strategy, partners, product strategy, geographic reach, market share, sales and marketing, product performance and features, product integration, and staying power. IBM and Cisco are some of the top suppliers in the global smart city market. They are ranked the highest in terms of strategy and execution.

II. SMART CITY BENCHMARKS

The Smart City Maturity and Benchmark Model has been designed to capture the key aspects of a city's transformation journey to become a smarter city. A smart city is characterized by a high level of community and citizen engagement, by its attractiveness for businesses and by efficient and sustainable city operations. The model allows a city to quickly assess its strengths and weaknesses in five key dimension areas related to city smartness and to set clear goals as how it wishes to transform over the next two to five years.

Table-1 smart city bench marks

| Performance Indicator | Benchmarks |
|--|------------|
| Coverage of water supply Connection | 100% |
| Per capita availability of water at consumer end | 135 LPCD |
| Extent of metering of water connection | 100% |
| Extent of non-revenue water | 15% |
| Continuity of Water supply | 24/7 |
| Efficiency in redressed of customer complaints | 80% |
| Adequacy of treatment and disinfection and quality of water supply | 100% |
| Cost recovery in water supply service | 100% |
| Efficiency in Collection of water supply related charges | 90% |

III. TECHNOLOGICAL OPTION FOR SMART CITY

As the buzz and excitement around the smart city project builds up further, here's a look at some key 'technologies' that will drive these cities:

➤ WATER ATMS

- Water ATMs, mini sewage, treatment plants and STPs.
- Status: 40 water ATMs and 3 mini STPs installed, work awarded for one STP

➤ LED LIGHTS

- LED lights to replace streetlights, pelican crossing, 3D zebra crossing, street furniture, Wi-Fi network, CCTV cameras and environment sensors. In Delhi, pilot on Mother Teresa Crescent road.

➤ DIGITAL LIBRARIES

- Digital libraries in schools across the city. Some 13 schools in Delhi have been selected for this. 3D printing labs have been set up in 10 schools.

➤ SMART TOILETS

- These smart toilets will have water ATM, vending machine and sanitary napkin vending machine. There's plan to set up 149 such toilets in Delhi. Of these, 29 have already been constructed and rest are expected to be completed by September.



Figure no.1: - technological options for smart city

IV. FINANCING OF SMART CITY

The Smart City Mission will be operated as a Centrally Sponsored Scheme (CSS) and the Central Government proposes to give financial support to the Mission to the extent of Rs. 48,000 crores over five years i.e. on an average Rs. 100 crores per city per year. An equal amount, on a matching basis, will have to be contributed by the State/ULB; therefore, nearly Rupees one lakh crore of Government/Urban Local Bodies (ULB) funds will be available for Smart Cities development. The project cost of each smart city proposal will vary depending upon the level of ambition, model, capacity to execute and repay. A number of State Governments have successfully set up financial intermediaries (such as Tamil Nadu, Gujarat, Orissa, Punjab, Maharashtra, Karnataka, Madhya Pradesh and Bihar) which can be tapped for support and other States may consider some similar set up in their respective States. Some form of guarantee by the State or such a financial intermediary could also be considered as instrument of comfort referred to above. It is expected that a number of schemes in the smart city will be taken up on PPP basis; the SPVs have to accomplish this. The GOI funds and the matching contribution by the States/ULB will meet only a part of the project cost. Balance funds are expected to be mobilized from:

1. States/ ULBs own resources from collection of user fees, beneficiary charges and impact fees, land monetization, debt, loans, etc.
2. Additional resources transferred due to acceptance of the recommendations of the Fourteenth Finance Commission (FFC).
3. Innovative finance mechanisms such as municipal bonds with credit rating of ULBs, Pooled Finance Mechanism, Tax Increment Financing (TIF).
4. Other Central Government schemes like Swatch Bharat Mission, AMRUT, National Heritage City Development and Augmentation Yojana (HRIDAY).
5. Leverage borrowings from financial institutions, including bilateral and multilateral institutions, both domestic and external sources.
6. States/UTs may also access the National Investment and Infrastructure Fund (NIIF), which was announced by the Finance Minister in his 2015 Budget Speech, and is likely to be set up this year.
7. Private sector through PPPs.

V. SMART CITIES: ISSUES AND CHALLENGES BY SMART CITY COUNCIL OF INDIA

By 2050, around 66% of the world's population will reside in urban cities. As of 2014, 32% of total Indian population lives in urban areas.



Figure no.2: - smart city: issues and challenges

Surprisingly, for the first time since Independence, the growth in urban population is higher than rural. This paired with rising migration to these developed cities necessitate that our cities be 'smarter'. Realizing this need, the government has shortlisted 20 smart cities out of 98 for its 'Smart Cities Mission'. This is the first time, a MoUD programme is using the 'Challenge' or competition method to select cities for funding and using a strategy of area-based development. This captures the spirit of 'competitive and cooperative federalism'. States and ULBs will play a key supportive role in the development of Smart Cities. Smart leadership and vision at this level and ability to act decisively will be important factors determining the success of the Mission. Understanding the concepts of retrofitting, redevelopment and greenfield development by the policy makers, implementers and other stakeholders at different levels will require capacity assistance. Major investments in time and resources will have to be made during the planning phase prior to participation in the Challenge. This is different from the conventional DPR-driven approach. The Smart Cities Mission requires smart people who actively participate in governance and reforms. Citizen involvement is much more than a ceremonial participation in governance. Smart people involve themselves in the definition of the Smart City, decisions on deploying Smart Solutions, implementing reforms, doing more with less and oversight during implementing and designing post-project structures in order to make the Smart City developments sustainable. The participation of smart people will be enabled by the SPV through increasing use of ICT, especially mobile-based tools.

VI. CASE STUDY ON SMART CITY

Sometimes just a vision for change can create an ocean of a difference. When Himanshu Patel was elected Sarpanch of Punsari, a quaint little village in Sabarkanth district Gujarat, in 2006 there was no sewerage connection, no street lights, no pukka roads and, of course, no source of income for the gram panchayat except the grants and funding from various state and Union government schemes.

Punsari is a village located in Sabarkantha district in the state of Gujarat, India. The village is located at about 80 km from the state capital, Gandhinagar. The village follows the Panchayati raj system. The village has undergone a transformation under the panchayat. There has been use of new and advanced technology in education. In this village have Wi-Fi connection for all people. Efforts have been made for the empowerment of women and increasing security in the village. Some of the facilities provided by the panchayat include local mineral water supply, sewer & drainage project, a healthcare centre, banking facilities and toll-free complaint reception service. Consequently, Punsari received the award of being the best Gram Panchayat in Gujarat. The village's model has been appreciated by delegates from Nairobi and they are keen to replicate this in Kenyan villages.

VII. SMART DATA CENTRE

Smart cities have been a seductive mirage on the horizon for some time, but they're finally solidifying into tangible reality. With annual investment poised to hit US\$16 billion by 2020, a host of global technology firms are now laying the foundations for new, hyper-connected urban environments as they chase a burgeoning market worth US\$1.5 trillion. As we hurtle towards 9.7 billion connected things in the next decade, smart cities promise to solve some of the most urgent and pressing issues facing society. From more efficient power grids that can slash carbon emissions, to putting an end to traffic jams and travel chaos, fully realised smart cities will be almost as revolutionary as the first wave of urbanisation in the Industrial Revolution. But will our existing infrastructure be able to cope?



FIG.: - SMART DATA CENTRE

While stylish 'smart' devices often dominate today's headlines, the intelligence of any smart city will ultimately derive from connectivity. Information from billions of connected things must be collected, analysed and interpreted in near real-time to create an urban environment that can seamlessly react to new demands in an intelligent way. Consequently, data centres will be the real brains behind smart cities. However, existing data centres will need to cope with a tsunami of information as smart cities become a reality: the 130 Exabyte's now running across global networks will be dwarfed by the 40,000 Exabyte's predicted by 2020. Facing this deluge, our current infrastructure won't be enough. Smart city planners will need to invest in new technologies and approaches today if they're to meet the demands of tomorrow.

VIII. INITIIVES IN VILLAGE DEVELOPMENT BY GOVERNMENT

Some argue that public-private partnerships result in higher water tariffs. But this will only happen when tariffs are too low in the first place and operating costs are not recovered. The fact is there must be revenue to cover operating costs, and it either comes from tariffs or government subsidies. If tariffs are too low and revenues come from subsidies, water and energy wastage increases because there is minimal investment and no incentive to conserve water or repair inefficient distribution systems. On the other hand, public policy makers must bear in mind that if tariffs are increased, they must be linked with better services. If subsidies are required, they must be carefully targeted for the poor and neediest sectors of society. While opponents of private sector participation argue that it will result in increased tariffs and negatively impact the more than 260 million Indians living on less than a dollar a day, the fact is that most of the poor in India today do not have access to any piped water at all! In fact, in order to get water many of India's urban poor currently pay up to ten times more per litre of water from unregulated private water vendors than their more fortunate neighbours do from the public utility, and often this higher priced water is unclean. The private sector can and does contribute sorely needed investment capital as well as vital technical and management expertise. In the case of Tirupur, the private sector raised the financing Rs. 1,023 crores necessary to finish the capital-intensive project. This public-private partnership also took responsibility for the design, construction, operations, and maintenance of the project. Independent auditors and engineers have been engaged by the local government and project partners to oversee the project. The U.S. Government, through the Agency for International Development (USAID), was proud to help underwrite the risk by providing a partial guarantee and technical assistance to this public-private partnership, an important first model in India to address the critical issue of water service delivery. So how do we move this model with its positive benefits forward? Governments at all levels should think creatively about how to work with appropriate private sector partners to address crucial water and sanitation issues. In addition, we must work together to create a legal and regulatory environment that allows for creative private sector participation in financing, designing, and operating infrastructure. Subsidies for water and sanitation services must be rationalised and targeted more appropriately. Only then will India begin to seriously address its water and sanitation issues and capitalise on the investments in infrastructure waiting to spur economic growth and improve the lives of its citizens. In the last budget, the government of India assigned Rs9,000 crores as the budget for Atal Mission for Rejuvenation and Urban Transformation. But I think the government needs to pause and think again. Do we really need smarter cities? Or should we be making our villages smarter? When we create a smart city, we try to enhance the efficiency of the city, thereby attracting more attention, and more people into the city and encouraging rural-to-urban migration. But that is not a healthy sign of development, as it does not leave room and opportunity for the country as a whole to grow. Instead of focusing our development and tools to enhance smartness in tier I cities, the government needs to make more efforts at creating tier II and tier III smart cities, and going further down to creating smart districts, taluks and panchayats. If such an approach is adopted, efficiency will start moving from the bottom to the top, rather than a top-down approach.

IX. CASE STUDY ON BARC INDIGENIOUS WATER TECHNOLOGIES ALREADY BEING USED AND DISSEMINATION OF THE TECHNOLOGIES IN INDIAN MARKET

As Narendra Modi government works towards achieving the Swachh Bharat mission, the Bhabha Atomic Research Centre (BARC) has come up with a solution to manage municipal waste and polluted water. Scientists at the India's premier nuclear research centre have devised four technologies that could go a long way in tackling the country's rising problem of uncontrolled municipal waste and treat the largely polluted ground and surface water for drinking. Enlarging the scope of radiation, scientists have developed the use of Gamma rays to cleanse municipal sewage sludge. According to official estimates, Indian cities and towns generate about 38,254 million litres per day (MLD) of sludge (0.1 per cent solid content in the sewage) of which only about 11,787 MLD is treated, leaving a capacity gap of 26,467

MLD."The high frequency radiation renders the pathogens inactive and degrades the toxic chemicals inside the sludge which presently is disposed into the sea or is incinerated, involving vast energy, or goes into the landfills after being transported through huge distances, causing environment degradation," said Lalit Varshney, Head of the Radiation Technology Development Division, BARC. the sludge, a vital source of macro and micro nutrients like Nitrogen Phosphorous, Potassium, Zinc, Iron and Copper, after being treated, becomes a healthy organic fertiliser for the crops. These plants could be set up both at Sewage Treatment Plants or elsewhere. In yet another mechanism, Nisargruna plant has been developed for processing the biodegradable waste materials generated in kitchens, vegetable markets, slaughter houses, food and fruit processing units, agro waste, biological sludge created in the effluent treatment plants of food, paper and textile industries and biomass. The technology produces organic manure and biogas after biomethanation. The Plasma Technology, which breaks down the hazardous and toxic compounds at high temperatures at garbage dumps, has also been upgraded by the scientists. While inorganic materials are converted into vitrified mass, organic materials could be pyrolysis or converted into gases like hydrogen, carbon monoxide and other lower hydrocarbon gases. These gases further could be employed in other uses. In what it calls as spin-off technologies, developed in the course of atomic research, the agency has also developed a coated Polysulfone membrane, which can separate the microorganisms up to 99.99 per cent when used in an online domestic water purifier. According to scientists, the device, does not require electricity or any addition of chemicals and effectively removes all suspended particulates, colour and odour from the contaminated ground water, unlike a conventional Ultraviolet treatment based membrane. The ultrafiltration membrane also removes secondary pollutants like fluorides, aluminium, arsenic and iron. For producing potable water from brackish hard water, removal of heavy metal contaminants, microbes, treatment of saline water in rivers and streams and for extensive industrial uses, BARC has also launched Thin Film Composite Charged Nano filtration Membranes. The technology also finds tremendous use in domestic water purification. In addition, a Dip-n-Drink Membrane has been introduced which could be taken to remote locations during disaster conditions to purify water. "All these technologies are fully developed and offer vast Make in-India opportunities for entrepreneurs," G. Ganesh, head of the BARC's Technology Transfer and Consultancy and Scientific Services, said.

X.ACKNOWLEDGMENT

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