



Editorial



This issue, the second in a series of special issues on the theme of ‘Smart Cities’, the first article on “Urban Governance and the Smart Cities Mission”, is written by veteran planner Edgar Ribeiro, and is aimed at city led economic growth through urban missions, notably, the JnNURM and the Smart Cities Mission, which have largely evolved through administrative and planning arrangements that are out of line with constitutionally mandated local government structures such as elected urban local bodies, district planning committees and metropolitan planning committees. The author calls this process a ‘constitutional reformatting’. It is argued that the mission programs could be efficiently implemented through elected mayor led urban local bodies rather than through appointed organizations like Special Purpose Vehicles. Attempts should be also made towards decentralization, as mandated by the Constitution, rather than towards centralization.

The second paper is focused on the theme “Participation and Citizen Engagement in the Smart Cities Mission: ‘Citizen Exclusion Points’ in New Delhi Municipal Council” authored by Prof. Dr. Ashok Kumar. The author argues that continual citizen participation and engagement in city planning is valued as it revitalizes local democracy, enables city planning agencies to better identify citizens’ needs and aspirations, and ensures legitimacy of planning policies when citizens willingly take ownership of these policies. In this paper the author critically examines the claim made under the “Smart Cities Mission” that Smart City Proposals are made and implemented through the full citizen engagement by looking at the case study of the New Delhi Municipal Council’s Smart City Proposal by using the new formulation ‘citizen exclusion points’. Mission design, institutional design, a major focus on area projects, and a technology focus are identified as the four ‘citizen exclusion points’.

The paper titled “Smart Housing for Smart Cities” is written by Prof. Dr. P.S.N. Rao, whereby the author states that housing remains one of the critical problems of planning. 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. In the past it has not worked because appropriate technology was not used. Smart housing is viewed as housing for the masses that can be created efficiently and effectively if smart technology is interlinked and integrated with HFA.

Dr. Ravindra Kumar, Dr. M. Parida and Dr. P. Parida have jointly authored the paper on the subject “Transport Infrastructure for the Smart Cities”. The paper underlines that the smart transport infrastructure should be perceived as a critical component for making smart cities in India. In order to realize smart transport infrastructure, major features of smart transportation infrastructure in the Indian context are discussed. A checklist for exploring alternatives of transport infrastructure is elaborated in this paper before suggesting measures for smart transportation infrastructure.

Amiya Kumar Das in his paper titled as “Smart Cities: Rethinking Urban and Rural Development in India” pleads for better planning of the Indian cities by focusing on the first principles of city planning. A focus on physical aspects of housing and infrastructure is emphasized in the paper. The paper argues for hassle free planning environment in planning agencies. Among other aspects, popularization of rental housing and high density residential development are proposed for tackling various city challenges being faced by the citizens in today’s large cities of India. It is also urged that planning education should be completely modernized in order to create new pathways for smart city planning.



“Emerging Smart Cities in India: Is it a Roadmap for Sustainable Urban Development?” by Anupreet Singh Tiwana highlights that the utopian concept of smart city is being advocated by the industry-led consortia as a human settlement where ultra-modern technology comes to the rescue of every urban challenge. The smart cities will include both the upcoming cities and existing ones; the ancient and heterogeneous all sorts of cities will come under the preview through the help of technocratic makeup. However, the paper while summing up highlights that the upcoming smart cities will be best suited to technologically literate population and might be less suitable for senior citizens, subalterns, poor and physically challenged residents. India needs not just ‘smartness’ from the information technology sector but a range of town planning, civil engineering, material sciences, architectural sciences and technology disciplines need to be amalgamated into a convincing, comprehensive and well-connected smart city plan.

A jointly written paper by Uttam K. Roy, and Prof. Dr. Najamuddin titled as “A ‘SMART’ Development Plan, Integrating People and Technology” emphasizes that smart cities could be built on the principles of inclusiveness, extent of participation and concern, action linkages, and technology. This paper attempts to connect smart people with smart technologies in a smart city in order to obtain several of these equity outcomes. A model to prepare a smart development plan is also developed to move in this direction. A number of key technologies such as GIS, GPS, remote sensing, cloud-computing and other ICT are briefly described in order to prepare a smart development plan.

Dr. Mayarani Praharaj has authored a paper on “Smart City Bhubaneswar: The Issues and Challenges”, which highlights the challenges of urbanization in the city including housing shortages and slums, problems of drainage and sanitation, traffic and transportation, solid waste management, etc. The paper also analyzes how a smart city project can be used to promote and ascribe value to cultural heritage of the city? It includes a discussion on smart cities approach to preparing the smart city proposal and its implementation strategies for making the city sustainable and smart for the future, and also focuses on the challenges of performance measurement by taking the case study of the temple city of Bhubaneswar.

The last paper focused on the theme “The Vulnerability of Smart City Mission” is written by Sugandha, who underscores that smart cities are mushrooming all over the world, and with technology advancements gradually focusing on a digital base. But Smart cities are not just about data and technology. Therefore, it is important to understand what further aspects could be added to design a sustainable city environment. A citizens’ viewpoint on the subject has been explored along with various components of smart city architecture to understand the different mechanisms involved in the context of energy cost and capacity building. Creative professionals could play a very important role in actualizing these mechanisms of smart cities on ground with sensitivity towards human interface. It is not just about a city being responsive and reactive instantaneously, but is about a city becoming predictive and evolutionary.

In India the idea of a smart has been introduced only recently, and it has quickly caught the imagination of planning scholars. Two special issues of the ITPI Journal and its readers are witness to this popularity. Being a highly contested concept as well the Indian policy, uncertainties about smart outcomes remain. Agencies in thirty three smart cities in India are already working hard to make this idea work. However, only time can tell how future unfolds in these smart cities.


Prof. Ashok Kumar
Editor



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Urban Governance and the Smart City Mission

Edgar Ribeiro

Abstract

Aimed at city led economic growth, urban missions, notably, the JnNURM and the Smart Cities Mission have largely evolved through administrative and planning arrangements that are out of line with constitutionally mandated local government structures such as elected urban local bodies, district planning committees and metropolitan planning committees. The author calls this process a 'constitutional reformatting'. Implementation of mission programs could be efficiently implemented through elected mayor led urban local bodies rather than through appointed organizations like Special Purpose Vehicles. Attempts should be made towards decentralization, as mandated by the Constitution, rather than towards centralization.

1. INTRODUCTION

The Smart City Mission (SCM) is one of the flagship programs of the central government. Processed through the newly crafted Niti Aayog and anchored primarily by the Ministry of Urban Development (MoUD), it replaces in effect the National Urban Renewal Mission (JnNURM) of the previous government as mentored through the since dissolved Planning Commission. With accelerated but sustainable urbanization as a prime objective, the erstwhile JnNURM focused on a citizen friendly urban renewal in metropolitan areas with over one million people, some of which were mega cities with over ten million people. For this, an attractive quantum of central funds was disbursed in stages and on a matching basis via the participating states for actions primarily through their elected metropolitan governments. As foreseen, the program was tweaked to incorporate all non-metropolitan capitals of states, and also a few key cultural - historical settlements but with the percentage of their matching funds substantially reduced in the process.

Based on the limited success of JnNURM as in operation through two successive Five Year Plan cycles, the SCM was heralded with an equally attractive central budget, primarily as 100 city accelerated employment generating program. The integration of inner city renewal, extended city retrofitting and peri - urban 'greenfield' development in each settlement has been projected as a major expected outcome through 7 year centrally monitored cycle. A rider for an

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assured maintenance of urban assets as created or restructured has been added as a challenge.

2. SELECTION PROCESS UNDER SCM

However, the urban settlements have not necessarily been selected on the basis of a projected national urbanization growth strategy but through a prescribed administrative process whereby the State's/UT's choose their own settlements from a centrally capped number of smart cities. Thus, the atoll island of Kavaratti - a census town *Panchayat* and capital of the Lakshadweep archipelago, the Oulgaret outgrowth in the UT of Puducherry, the Namchi Bazaar growth center in Sikkim, the settlement of Diu in the UT of Daman and Diu and the sole urban area of Silvassa in the UT of Dadra - Nagar Haveli find themselves in the club of 100 smart cities along with major municipal corporations and large settlements, thirteen of which are in Uttar Pradesh and twelve in Tamil Nadu. Interestingly, for the sole allotment in the NCT of Delhi (NCTD), the MoUD have *suomoto* selected the relatively cash rich New Delhi Municipal Council (NDMC) area which houses all the apex arms of federal governance and is therefore, uniquely free of local government electoral based processes.

3. SELECTION OF PANAJI UNDER SCM AND AMRUT

Expectedly, for India's smallest state, the Government of Goa (GOG) have ensured the participation of Panaji, its capital, in the mission and where the jurisdiction of the Assembly segment with its sole elected legislator is approximately co-terminus with that of the City Corporation of Panaji (CCP) with its thirty wards each with an elected councilor. This geographic entity, which received unfavorable implementation assessments under JnNURM, got approval under the SCM as early as the second round of evaluations on basis of its project report fulfilling basic mission requirements. Panaji also now qualifies under the 500 City "Atal Mission for Rejuvenation and Urban Transformation" (AMRUT) as a state capital though the settlement is short of that mission's one lakh plus population criterion. There are other modest amounts of central funds for shelter upgrading and the like which could be tapped for Panaji's dedicated use apart from central grants-in-aid. However, each such transfer has its own federal related audit drill. Also, pointedly between SCM and AMRUT, there are overlaps in mission goals and objectives when applied to the same settlement. Thus a smart orchestration of the smart city Programs and projects emerges as an up front requirement. Arguably, this may have prompted the State to directly operate the mission



through its own parastatals rather than through the CCP as constitutionally structured for participatory governance.

In this scenario, the Mayor of the CCP has gone public in objecting to the mere supporting role meted out to his Corporation in this nationally monitored program for a geographic area where the third tier is accountable to a compact demand driven electorate. Such rumblings are reportedly surfacing in a few other SCM settlements as well. In fact, doubts are now being expressed on whether the Mission despite its finely tuned guidelines, has adequately addressed the basic issue of “who governs or orchestrates city government towards a smart livable future”. This is critically relevant in the context of the 73rd and 74th Constitution Amendment Acts, 1992 (Government of India, 1993) through which those elected to municipalities (Municipal Corporations or MC’s, Municipal Councils or MCI’s, *Nagar Panchayat* or NP’s and their equivalents) and Village *Panchayats* or VP’s can no longer be constitutionally superseded peremptorily.

4. URBAN GOVERNANCE AND MANAGEMENT

Simply stated, unambiguous settlement level developmental governance emerges as the key for investing in smart urbanization. In fact, the lack of it had largely triggered the 1992 constitutional amendments. The late K.C. Sivaramakrishnan who was privy to the processing and guided application of these constitutional amendments, when evaluating the impact of the JnNURM carrot in the 63 selected settlements, lamented that no clear replicable format for settlement level participatory governance emerged from any of the evaluated experiences. Similarly, Emil Wagelin in assessing the impact of the Asian Development Bank funding in selected mega-urban regions of Asia as incubators of global economic exchanges, narrated how in the primate Metro Manila of the Philippines alone, seventeen city governments and sixteen other local bodies operated without interacting with each other, resulting in an Infructuous duplication of public resources.

As part of debates on city governance, Paul Johnson in ‘The Voluntary City’ mentions that to implement the ground plan for London that addressed land use correctives after the pestilence and great fire of 1666, a directive was required which stated, “By City Government on the King’s command”. In the earlier century of city states, Lewis Mumford in his classic ‘The City in History’ devotes a full chapter captioned ‘The Era of Baroque Despotism’ in eulogizing Sixtus V for tearing down Rome in his six years of papacy, with a conductor’s baton



that restructured the 'eternal city' to its current axial monumentality. From such early forays, major countries of the European Union have emerged through unitary governments and smart cities with powerful Mayor-in-Council structures. In contemporary times of federated governance for larger nations, the Mayor of Metropolitan New York is arguably the second most powerful person in the USA as the accountable orchestrator of over a hundred governmental bodies and other service providers, through budgets for which households contribute around fifteen percent of their incomes for assured services. In a diametrically opposite model in the command economy of China, the three principal mega urban regions of Beijing, Shanghai and Tianjin are being centrally developed and maintained as national cities. With accelerated urbanization in focus, federal control has now been extended to at least ten of their other rapidly growing mega urban magnets.

5. GOVERNANCE AS THE CONSTITUTIONAL REFORMATTING

By and large, nations today, in both their 3 - tier federated or 2 - tier unitary structures, are providing competitive urban forms and ambiances for their cities through actions steered by their local governments with mayors or equivalent at the helm. However, in India, the constitutional reformatting of the erstwhile colonial pattern of administration through presidencies, provinces and princely states, has led to the present day federalism bolstered by a continually facilitated center-state electoral equation. Thus, through adult franchise, the lawmakers through parliamentary constituencies and their assembly segments, have provided and regulated the instruments of municipal and *panchayat* level developmental and regulatory growth and wellbeing. In the process, the functions of several local bodies were systematically reduced to primarily ensure that the levels of settlement hygiene did not deteriorate. Even the supersession of such authorities was common until it was stymied by the 1992 constitutional amendments through an assured ward level constituency for a down top participatory process for urban and rural settlement level functions.

5.1 Experience of JnNURM

The Constitution Amendment Acts of 1992 and which came in the wake of the federally liberated licensing policy and the right to information on governmental actions facilitated a further transparency through vastly improved base maps. These were to emerge as a tool for clearly understood spatial plans as a help in shortening written narratives and simplifying built space controls in development plan documents at integrative ward, settlement and district levels as platforms for programed socio-economic investments. To



incentivize actions through this citizen digestible three-tier process, JnNURM was launched as a major urbanization catalyst for programmed sustainable development on land which has since been recognized as a rapidly dwindling national resource.

In retrospect, JnNURM aimed at a national hierarchal canvas through state coalesced vision documents that gave credence to:

- **Megacity Regions** as structured for global city exchanges and as composed of Metropolitan Agglomerations so as to provide a grid of national engines of sustainable growth. Accordingly, constitutionally crafted Metropolitan Planning Committees (MPCs) under article 243ZG and the Mayor-in-Council system (with the Commissioner re-slotted as its Chief Executive) were envisaged; and
- **District Planning Committees (DPCs)** under article 243ZD that were to facilitate the sustainable growth of :
 - Large cities (between 3 lakh to one million citizens) as state regional incubators of investments processed through the Commissioner of Municipal Corporations under a Mayor and Standing Committees;
 - Small Cities (between one to 3 lakh citizens) and large and medium towns (between 20,000 to one lakh citizens) as District or sub-regional hubs through MCLs under a President or Chairman for processing growth through a Chief Executive; and
 - Small towns as NPs and where with census towns and other VP's are disaggregated into Electoral Wards for facilitating participatory built neighborhoods.

From this nascent but functional hierarchal interplay of mega-cities, metropolitan areas, cities, towns and *panchayats* of grouped villages, participatory development began slowly emerging on the geographic mosaic of India. Even the Census which traditionally just distinguishes between town and village in disseminating data with increasing sophistication began to recognize this interplay of settlements as a basis for varied state level developmental investments. Yet, several critical goals of integrative and participatory growth remained unanswered despite the utilization of the attractive JnNURM federal carrot and which on evaluation was found to have been severally diverted for ongoing non-participatory State projects outside JnNURM guidelines. Reportedly funds were even used for meeting shortfalls in ongoing ULB mandated activities.



The more important of deviations from constitutional mandates and as left open ended through JnNURM when in operation are:

- The uncertainty of the states in establishing MPCs for all metropolitan areas and which ideally is to be co-terminus with full revenue districts. Such constitutional bodies are to largely comprise of members elected from all three levels of governance and to authoritatively orchestra the State appointed Metropolitan Development Authorities (MDAs). At present only the Kolkata Metropolitan Area has a legislatively functional MPC in place with prospects of being operationally fine-tuned through its MDA.
- With Municipal Corporations increasingly required to spearhead urban renewal as central to MPC and other large city strategies, the failure of states to create the Mayor-in Council structures typically stands out. This is especially so after the endorsement of the conclave of Mayors at their hustings in Visakhapatnam in the mid-nineties to change over to this system whereby the Municipal Commissioner acts as the Chief Executive to the elected Standing Committees under the elected Mayor. At present, only West Bengal and arguably Madhya Pradesh have legislatively processed such a change as a boost for people centric participatory development.
- With DPCs as now constituted by most states, the need to administratively enable them to oversee Spatial Development Plans in all non-MPC revenue districts is overdue. This would offer greater transparency in participatory growth at interactive regional, settlement and ward levels. At present, only Kerala has advantageously used existing instruments for this process and which is required to be in sync with regularly updated State Vision directives.
- With municipalities and village *panchayats* now legally disaggregated into functional electoral wards across India, the need to interpolate regional and settlement level land uses on spatial Ward Plans as supplemented by neighborhood level development and redevelopment needs is overdue. At present, only the NCTD has incorporated such a process in its statutory Master Plan aimed at offering greater transparency and participation in the development planning process.

Based on the above assessments of the JnNURM when in operation, it can be inferred that the States of the Union have been lukewarm to facilitating down-top reforms. Primarily this was because it required the sharing of powers and



exchequer funds with compact third tier elected constituencies of wards where accountability to neighborhoods well-being was expected to transcend political agendas. Therefore, it is to be seen whether the SCM with its equally attractive central exchequer carrot would be able to restore and then restructure the several unfinished constitutionally supported settlement focused agendas of JnNURM.

6. PROGRESS OF THE SMART CITIES MISSION: CRITICAL ISSUES

With just two of the first 7 year SCM cycles in operation, it is little early to assess how the Mission will unfold for a pan India integrated urbanization canvas. However, current signs are not encouraging based on the following observations:

The functional interplay of urban settlement hierarchies for investments appears to have been replaced by the 'city' as a singular all-encompassing urban entity through a center-state consultative process. Thereby the financial transfers to the state through an administratively processed 100 city SCMs could unsettle the ongoing inter-related directional urban growth patterns based on size, functions and governance. As two extreme examples, the islanders of Kavaratti may not be able to reconcile their existing *panchayat* status in fragile surrounds for participation within the new federated club of 100 cities. At the other end, the regulated low density and relatively financially stable NDMC as engulfed by the three high density MCs of the NCTD within the extensive National Capital Mega Urban Region (NCR) spilling into three states of the union, has been selected for the Mission despite its unique structure with little or no scope to contribute to an accelerated national urbanization process. Accordingly, there is doubt whether replicable lessons in balanced urbanization would emerge from these and a few other smart cities.

With the exception of MPCs, the third-tier of governance is now largely in place across India at district, sub-district, municipal and *panchayat* levels. Unfortunately, the state processed elections to these bodies have led them to emerge on basis of political affiliations and largely as extensions to the second tier of governance. Accordingly, municipalities and *panchayats* seem to be kept busy with regulatory processes rather than in promoting neighborhood wellbeing. The state of Kerala, however, seems to be addressing this issue through well-articulated participatory and sustainable Spatial District Development Plans as disaggregated into Settlement and Ward Plans and which incorporate simplified



development control regulations. It could be a challenge for the SCM to expand or restate their focus based on this and other such constitutionally savvy experiences.

Currently, a trend is discernable towards the subtle centralization of the federal structure with one of its critical aims being to accelerate basic infrastructure provisions towards employment generating land uses and built space. Thus, sectoral projects insulated from each other could continue being rushed outside the settlement level sustainable development capabilities. Therefore, the ensuring of a clear integrated spatially driven integrated development system is yet another major challenge that the SCM would have to address.

Basically however, the success of the federal flagship SCM as bolstered by AMRUT and other NITI Aayog mentored urbanization programs, critically centers round urban governance - an issue left open-ended under the JnNURM. In the context of the 73rd and 74th amendments to the Constitution, 'State Vision' documents updated as and when necessary, are expected to drive the down top governance process as best anchored within a hierarchical urbanization structure. The trigger for such a process in the 'Global South' was laid down over two decades ago by UN-HABITAT when promoting sustainable urbanization to ensure urban security and safety. They thus, focused on the curbing of environmental degradation; on the facilitation of in-situ sanitization of the Below Poverty Line (BPL) urban pockets; and on improving access to basic urban services, like potable water and sanitation and to the up gradation of shelter. Accordingly, the global member-states endorsed the improvement of municipal resources and decentralized urban governance through beneficiary participation as the key action areas for integrated urbanization in both the federated and unitary forms of governments.

A fact that also needs being underlined is that unlike in the nations of the Global North which are required to address issues of reduced or even minus population growth rates, urbanization in India as in several nations of the Global South, is escalating. From about thirty percent urban in 2011 to a projected nearly fifty percent by 2051, translates into nearly four hundred and fifty million more urbanites over just a forty year period. Of these nearly three-fourths would be by households gravitating from rural surrounds, particularly to mega-cities and other large urban agglomerations and for which the National Commission on Urbanization (NCU) in the 1980's assessed that servicing them at decadal



growth rates beyond thirty percent would be beyond the capabilities of ULBs. Accordingly, re-densification and guarded peri-urban growth, emerge as urban management priorities especially as access to land and concomitant up front basic infrastructure for new towns and other growth centers is going to be increasingly expensive. Ever since, policies and strategies in regulating the rush to urban India have been high on national sustainable development agendas.

In this scenario, the CAA 1992 under article 243-W stresses the need to devolve powers and responsibilities to ULBs and that to through law and not through just rules and executive orders. Correspondingly, through the Twelfth Schedule, it allots eighteen settlement related tasks to ULBs. In addition, under article 243-S all ULBs with populations exceeding three lakh are to have committees for each ward to spearhead public participation through an elected councilor. Thus, the constitutional focus has been on the electoral wards of local bodies as the designated compact down-top participatory game-changers and for which transparency in socio-economic investments through multiple players was projected for orchestration through Spatial Development Plans.

Accordingly, for restructuring urban management as the reference point for making cities smarter, a concerted upgrade is required of ULBs and their financial health. Currently these continue being dependent on grants-in-aid and which get substantially gobbled up for meeting the escalating costs of civic housekeeping. Very few ULBs have been able to generate resources to levels that have facilitated market borrowings by them for even moderately visible civic developments and maintenance. Very generally as civic resources increase as in Mumbai and Ahmadabad, regulatory powers of LSGs, escalate as a challenge to state diktats. However, as they cannot be superseded the states attempt to slot them politically with reference to assembly segments. As an example, the City Corporation of Chennai which was superseded by the state from 1956 upto 1992 has yet to come to terms with down-top governance in the era of unpredictable climate change.

6.1 Lessons from Experience of JnNURM

As the promotion of actions through LSG is a constitutional requirement, funds under JnNURM were earmarked for their improved system of records and for the easing of access to the same by citizens. Accordingly, simplified accounting procedures as also the frequent mapped updating of land and built space ownerships-cum-usage data were incentivized as platforms for enhancing



LSG revenues. What guardedly surfaced was (a) a rationalized mechanism for enhancing the collection of user charges, as part of LSG share for critical uses like power and water and for the management of solid and water borne waste disposal; (b) a frequently updated property value spatial matrix for improving revenue collection on land ownership and its usage, incorporating deterrent charges and related actions for misuse and violations and (c) a regularly updated charges for undertaking development or betterment, for goods entry, for idle parking of vehicles, for the misuse of civic spaces and assets and the like.

However, success on this front has been lackadaisical. This has in no small measure been due to the LSG electorate invariably opposing additional taxes and user charges unrelated to a corresponding improved level of services and facilities. The problem gets compounded by the fact that state governments and their in built sectorally hierarchical structures are not known to undertake development efficiently on the one hand and on the other, LSGs are reluctant to take over from state agencies the maintenance of poorly developed infrastructure. Also, the quantum of unused and under-utilized lands with government in urban settlements is not only disproportionately high, but the states generally exempt themselves from most LSG regulatory controls and charges for use or misuse. The state is also known to authoritatively intervene on behalf of private players against LSG rulings. These are major issues to be followed up through SCM financial support.

Currently, through three rounds of SCM evaluations, over a third of the selected 100 smart cities have received first phase funds. It is yet unclear on the weightage given to orchestrated urban governance in these grants incentivized mission through multiple projects by multiple players - governmental or otherwise. Hopefully, the yet focused message from the 1992 Constitution Amendments of “sustainable development through spatial frameworks” has survived as the legal platform for the release of public funds. Lately, however, doubts are surfacing on this score as well. From media reports it has come to surface that for Panaji, which is now under the embrace of the federally orchestrated SCM and AMRUT, the state government has currently processed an update of the city’s Outline Development Plan incorporating demands for enhanced Floor Area Ratios by owners or promoters of land and built space. The Mayor of Panaji, however, has gone public in lamenting that as doubts by the local body were not given due weightage to this Outline Development Plan, his Corporation was not in a position to give permits for enhanced built



space until the additional infrastructure was first in put in place. This type of dichotomy between the second and third tier of federated governance is typically beginning to surface across urban India. This is especially so after the escalating negative impacts of unpredictable rapid climate change on fast growing settlements and for which uncoordinated government actions are being targeted as the root cause. Also what alarmingly stands out from the current Panaji Outline Development Plan experience is the use of the Spatial Development Plan by and through the state government as a mapped platform for investments through uncoordinated and selective development incentives without clear citizen and beneficiary involvement.

7. CONCLUSIONS

Future of government's 100 smart city flagship project - the Smart City Mission - increasingly rests on urban governance, an issue on which the state governments through their high profile consultants for the selected settlements may have, in varying degrees, left open-ended and unaddressed. As sustainable development through accountable corporators and *panches* of people centric wards instead of mission implementation through Parliament and its Assembly segments as this is not the focus of the Constitution. The importance of the Smart City Mission stands out for ensuring workable urban governance platforms for national integrated investments.

To build a city is something happy to think of. To create a new town is itself a happy thing. There cannot be a greater joy than to create, it is almost godlike to create. To be associated, therefore, with the construction of a city has been a thing which I appreciate the most.

Jawaharlal Nehru



Participation and Citizen Engagement in the Smart Cities Mission: 'Citizen Exclusion Points' in New Delhi Municipal Council

Ashok Kumar, Ph.D.



Abstract

Continual citizen participation and engagement in city planning is valued as it revitalises local democracy, enables city planning agencies to better identify citizens' needs and aspirations, and ensures legitimacy of planning policies when citizens willingly take ownership of these policies. In this paper the author critically examined the claim made under the "Smart Cities Mission" that Smart City Proposals are made and implemented through the full citizen engagement by looking at the case study of the New Delhi Municipal Council's Smart City Proposal by using the new formulation 'citizen exclusion points'. Mission design, institutional design, a major focus on area projects, and a technology focus are identified as the four 'citizen exclusion points'.

1. INTRODUCTION

Since it came to power in 2014, the present Government has been busy in framing urban planning and development policies. The "Smart Cities Mission" is only one of the several policies launched by the government since June 2014. Other significant policies include the Atal Mission for Rejuvenation and Urban Transformation (AMRUT), National Heritage City Development and Augmentation Yojana (HRIDAY), Pradhan Mantri Awas Yojana, Swachh Bharat Abhiyan, Skill India Mission, Digital India Program and most importantly 'Make in India' aimed at making India the global manufacturing hub. Most of these policies are designed in the mission mode suggesting the urgency for their implementation, which is a laudable concern. In line with such thinking, selection of cities for a number of missions has been completed and city specific programs have been chalked out for implementation within the fixed time span. It appears that Government of India is steadfast in transforming India for the better by transforming Indian cities through redevelopment, renewal and new ways of city building.

This paper is an attempt to make a critical intervention in this policy framing debate when almost all Indian journals and all newspapers have published multiple articles on new policies. This paper particularly examines the Smart Cities Mission with a specific focus on the idea of 'public or citizen engagement' as entailed in this policy. There are two main reasons for focussing on public engagement in the Smart Cities Mission. First, in the modern times city making has been largely viewed as a collective and institutionalized endeavour where peoples' involvement in the form of orderly development of urban settlements is considered to be an inseparable part of planning and development. This places

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public engagement at the nub of city planning and development. Second reason for analyzing public engagement is to assess its technology centric nature as public participation (the term generally used for public involvement in city planning) has been changed to 'touch points'. What are the implications of this change from public participation to public touch points? Does public touch points in any significant way change the nature of public engagement in planning processes?

In order to critically understand the formulation of 'citizen engagement' and how this differs from traditionally statute based public participation in planning, forms the second part of this paper. The third part of the paper reviews some of the salient features of the Smart Cities Mission that directly relate to the aspect of citizen engagement along with a brief review of the selected Smart City Proposals (SCPs) in order to provide empirically grounded evidence and illustrations about the citizen engagement. The fourth part offers critical insights about citizen engagement by examining the New Delhi Municipal Council's Smart City Proposal at State 2. In this part I also develop the idea of 'citizen exclusion points' - those aspects of the Smart City Proposal that thwart citizen engagement in New Delhi Municipal Council area.

2. PUBLIC ENGAGEMENT AND PARTICIPATION

Public participation is not new to city planning and development. Sherry Arnstein is the most cited and celebrated author of the classic paper titled 'A Ladder of Citizen Participation'. As one moves from bottom to top and traverses the ladder upwards, the degree of participation increases leading to the top of ladder called 'citizen control' where "have-not citizens obtain the majority of decision-making seats, or full managerial power" (Arnstein, 1969: 217). More recently more complex understanding of public participation has been developed by Archon Fung (2006) who argues that for effective public participation we need to focus on the three dimension of participation. First dimension is a clear understanding of the participants who participate in a decision making situation implying whether participation is voluntary to all citizens or by invitation for selected elite. Second dimension of participation is about the nature of participation i.e. whether participatory processes are discursive, deliberative or only informing. Third dimension of public participation is how what gets decided through participatory processes (information receiving, discussions, and deliberations) links up with policy making and implementation.

At about the same time a well-known planning scholar Leonie Sandercock (2005: 437) noted that public participation in planning has become critically important due to the following reasons:

- The crisis of the expert knowledge
- Failure of the city-building professionals



- Crisis of the representative democracy
- Issues of the neglected and marginalized citizens
- Recognition of difference
- Politics of difference

Inness and Booher have argued that involvement of public in planning could achieve a number of purposes. First, decision makers want to find out public's preferences that can play a part in their decisions. Second, public participation can improve decisions by incorporating citizens' local knowledge into the calculus. Third, public input can also advance fairness and justice. Fourth, participation is used to secure legitimacy for public decisions. Fifth, participation is done because the law requires it (Inness and Booher, 2004: 422-423).

Complexities of effective citizen participation have been highlighted ever since challenges to rational planning began to emerge in 1960s. "The idea of citizen participation is a little like eating spinach: no one is against it in principle because it is good for you" (Arnstein, 1969: 216). Governments and power-holders drop this virtuosity when poor city dwellers begin to demand redistribution of decision making powers and the myth of participation explodes. In spite of the fact that it does not take much for public participation to turn into pure tokenism, "public participation is usually considered an unalloyed good. This emphasis on the inherent desirability of public involvement is part of a tradition which seeks to 'open up' planning processes to democratic scrutiny and to expand the scope of public involvement as an integral part of improvements in policy delivery" (Rydin and Pennington, 2000: 153). They also highlight two rationalizations of public participation in environmental planning. First rationalization is about "the democratic right to be involved in the public policy process and the importance of all barriers to such involvement being reduced or withdrawn. The emphasis here is on enabling access to the policy process, encouraging the take-up of that access and ensuring that such participation makes a difference to policy outcomes. The policy process is seen as a locus for the articulation of values and preferences on policy options, and public participation is a means of bringing the pattern of values and preferences represented within the policy process closer to that existing within society as a whole" (Rydin and Pennington, 2000: 154). "The second rationalization focuses on the effectiveness of policy delivery and considers how public participation can assist in producing a 'better' policy outcome" (Rydin and Pennington, 2000: 155).

Whatever its rationalizations, public participation implies 'efforts to increase public input, oriented primarily to the content of programs and policies'. Inclusion means 'continuously creating a community involved in co-producing processes, policies, and programs for defining and addressing public issues'. Both are dimensions of 'public engagement' (Quick and Feldman, 2011: 272). Public



engagement therefore, embraces both participation as well as inclusion widening the scope of peoples' involvement in planning and development of cities. Here public engagement is viewed as transformative and empowering in terms of its impact on policy making and redistributive in nature, specifically for those located at the margins of decision making regimes. But even before the term citizen engagement became commonplace "participation without redistribution of power is an empty and frustrating process for the powerless. It allows the power holders to claim that all sides were considered, but makes it possible for only some of those sides to benefit. It maintains the status quo" (Arnstein, 1969: 216).

Today both in city planning and administration, we have moved beyond public participation and engagement because policy making and implementation is seen as a collaborative work where "the coproduction approach assumes that service users and their communities can – and often should – be part of service planning and delivery" (Bovaird, 2007: 846; see Healey, 1997 for similar arguments in city planning). Terming coproduction as 'we government' Dennis Linders proposes three dimensions of coproduction - citizen sourcing, government as a platform, and do-it-yourself government. I take ideas of (Bovaird, 2007), Quick and Feldman (2011) and Linders (2012) together and view public engagement as a situation where policy planning and implementation processes, institutions, and outcomes are co-produced by public agencies and local communities.

Public engagement is centered on ten core principles. These begin by listening; attend to people's leading concerns; reach beyond the "usual suspects"; frame issues for deliberation; provide the right type and amount of information at the right time; help people move beyond wishful thinking; expect obstacles and resistances; create multiple, varied opportunities for deliberation and dialogue; respond thoughtfully and conscientiously to the public's involvement; and build long-term capacity as you go (Center for Advancement of Public Engagement, 2008; (Table 1).

3. PUBLIC PARTICIPATION AND ENGAGEMENT IN INDIA

Public participation in planning in the Indian cities is provided through state mandated planning laws. Generally statutory public participation takes place only after a draft of a city plan is prepared by a planning agency without much involvement of the citizens. Citizens come into view only when a draft planning agenda is already set by a planning agency largely led by politicians, bureaucrats and planners. But there are few exceptions to this trend. For example, the state of Goa involves public in planning even before drafts of various kinds of plans are prepared. Kerala similarly engages public in the plan making processes prior to the preparation of drafts of development plans. Whatever may be the degree of influence the citizens are able to exert; public participation in plan

**Table 1: Ten Core Principles of Public Engagement**

S. No.	Core Principles of Public Engagement	Explanation of the Principle
1.	Begin by listening	Effective listening involves being attentive to peoples' concerns, aspirations, knowledge base, mis-perceptions, and initial solutions.
2.	Attend to peoples' leading concerns	Leaders and policy makers should acknowledgment and address peoples' concerns even when they do not match with their own concerns.
3.	Reach beyond the "usual suspects"	Find the ways to include or represent those who are traditionally excluded from decision making processes.
4.	Frame issues for deliberation	Use language that people can understand to address public concerns, keep the technical details to a minimum, and present people with information for weighing different options.
5.	Provide the right type and amount of information at the right time	Present to people carefully selected non-partisan information for effective deliberations and do not overload people with information. Overload of information overwhelms and disempowers people.
6.	Help people move beyond wishful thinking	Trade-offs should be highlighted so that people can look for multiple ways of achieving certain outcomes.
7.	Expect obstacles and resistances	Multiple opportunities should be provided for absorbing information about the trade-offs and working through problems.
8.	Create multiple, varied opportunities for deliberation and dialogue	Inclusivity is central to dialogue and deliberations. Multiple opportunities for people to learn, talk, think and act about problems contributes to inclusivity.
9.	Respond thoughtfully and conscientiously to the publics' involvement	Public engagement is incomplete with policy makers responding adequately to peoples' involvement including letting public know how their inputs will be used in policy making to foster respect and trust.
10.	Build long-term capacity	Public engagement is more than public problem solving. It is about better reach out, working collaboratively in order to build common ground.

Source: *Center for Advancement of Public Engagement, (2008: 3-5).*

making processes has been designed as a city wide phenomenon covering all citizens. It is a different matter that given the present design of institutionalized participation, a minuscule part of the citizenry participates. One reason for non-participation and lack of interest in plan making activities is the lack of trust citizens have in the policy makers where people feel participation may not be able to bring about transformative and empowering changes. Citizens'



indifference to planning get exacerbated when they see plans finalized and approved without citizens even getting a chance to know how their inputs were considered before excluding them from approved plans. So the existing arrangement of public participation in the draft of a city plan is unlike public engagement as defined above.

Citizen engagement in the preparation of Smart Cities Proposals under the Smart Cities Mission further restricts public participation and this has various dimensions which could be discussed as 'citizen exclusion points' from the public debate and deliberations for influencing and delivery of public planning policies. Under the Smart Cities Mission citywide (pan-city) plans are given lesser importance as indicated through the award of scores than the Strategic Action Plans which include three type of projects - retrofitting, renewal and greenfield development (Ministry of Urban Development, 2015: 21). As C. Rammanohar Reddy has shown: "The focus is almost entirely on the area-based plan. In fact as much as 81 percent of the total outlay in the proposals for the 33 cities is on area-based plans" (Reddy, 2016: 81). This kind of citizen engagement excludes a vast majority of the citizens from the participatory processes since projects are meant for specific geographical areas, and it is increasingly becoming clear that all people living in a smart city project area may also not get a chance to participate in an area plan. Even when citizen participation is solicited for a pan city proposal citizen engagement is "achieved through citizen consultations, including active participation of groups of people, such as Resident Welfare Associations, Tax Payers Associations, Senior Citizens and Slum Dwellers Associations" (Ministry of Urban Development, 2015: 22). This indicates that citizens would be participating indirectly through these organizations in identifying their needs and aspirations leading to probable misrepresentation of citizens' desires.

Misrepresentation has resulted in much avoidable controversy that is generated through a number of smart city proposals in various cities. For example, in Dehradun people have been agitating because the state government plans to build a smart city over the existing tea estate measuring 1,900 acres. Echoing the sentiments of the public at large after Dehradun could not make it to the second list of smart cities, Mahesh Bhandari, President, Doon Residents' Welfare Front noted: "The authorities did not do their homework and failed to realise that the citizens want retrofitting for the whole city and not just of few parts. The proposal could have been made more innovative and eco-friendly like other cities but that was not done" (Budhwar, 2016). In new Bhopal 333 acre area in Shivaji Nagar is slated to be redeveloped for ultra-modern apartments and business centres. People have been asking why develop Shivaji Nagar which is already better developed than several other areas in the city (Ghose, 2016). Citizens appear to view the smart city proposals as misplaced; not representative of the needs and aspirations of the general public.



Another dimension of ‘citizen exclusion points’ is the setting up of the Special Purpose Vehicle. The Smart Cities Mission will be implemented by an organizational arrangement dubbed as the Special Purpose Vehicle. The SPV is a limited company incorporated under the Companies Act 2013, and will be promoted by equity share holding of 50 percent each by the state government and an urban local body. Private sector and financial institutions could hold equity shares in the SPV if equal share of equity shares between the state government and urban local body are maintained. The SPV will perform several functions. “The SPV will plan, appraise, approve, release funds, implement, manage, operate, monitor and evaluate the Smart City development projects. Each Smart City will have a SPV which will be headed by a full time CEO and have nominees of Central Government, State Government and ULB on its Board” (Ministry of Urban Development, 2015: 12 and 35-36). The SPV must ensure that it is a credit worthy organization in the market, which is able to raise resources from the market. The SPV is allowed to implement projects through joint ventures, subsidiaries, public-private partnerships, turnkey contracts, etc.

This kind of organizational arrangement is highly focussed on efficiency, productivity and profitability, which on its own terms is not to be derided. But after 74th amendment to the Constitution of India enforced in 1993, elected municipalities have a major role to play in city building and maintenance including land use planning as listed in the Twelfth Schedule to the Constitution. However, in the Smart Cities Mission, the elected urban local government appears to have little or no role in the implementation of the Smart Cities Mission except some participation of selected mayors and municipal commissioners or chief executive of ULBs in the State Level High Powered Steering Committee and very limited participation of some ULBs in the Board of Directors of the SPV. Central government expects that “the rights and obligations of the municipal councils with respect to the Smart City project [are delegated] to the SPV” (Ministry of Urban Development, 2015: 39). If these organizational arrangements were to be implemented, it will create a large ‘*democratic deficit*’ and even larger democratic deficit in cities like Delhi where municipalities directly report to central government and not to the state government.

On the other hand, national level Apex Committee headed by the Secretary, MoUD with representatives from related ministries and organizations will approve proposals for the Smart Cities Mission, monitor their progress and release funds. This Committee will consist of Secretary, Housing and Poverty Alleviation, Secretary (Expenditure), Joint Secretary, Finance, MoUD, Director National Institute of Urban Affairs, Chief Planner, Town and Country Planning, select Principal Secretaries of States and select CEOs of SPVs as members with Mission Director as the Member Secretary. Further, the Representatives of organizations such as UN Habitat, World Bank, TERI, Centre for Development



of Advanced Computing, Centre for Smart Cities Bangalore and other bilateral and multilateral agencies and urban planning experts could be invited (Ministry of Urban Development, 2015: 15). On similar lines state level committees headed by respective state Chief Secretaries would be established with the exception that such committees would also include selected mayors and municipal commissioners or chief executive of ULBs, and heads of concerned line departments. This bureaucratic arrangement at central and state level may appear necessary and interventionist, but it is appropriate for disbursement of funds and monitoring of projects under the Smart Cities Mission. In this backdrop, now I turn to the case of New Delhi Municipal Council.

4. PUBLIC ENGAGEMENT IN THE NEW DELHI MUNICIPAL COUNCIL

New Delhi Municipal Council (NDMC) is governed by appointed civil servants who are accountable to central government. At the very basic level public engagement would warrant that eligible voters are able to elect their own representatives and are empowered to elect new representatives periodically if they do not fulfil the aspirations of the citizens. Elaborate provisions for elected urban local government are made through the seventy fourth amendment to the Constitution of India. But this constitutional amendment has not been made operational in the NDMC area. Next level of public engagement emerges from the provisions to prepare local area plans at the scale of a ward whereby people are entitled to frame planning policies for their own neighborhoods. Public engagement at the Local Area Plan level has been anything but effective because organizations responsible for the preparation of these plans treated these planning exercises as consultancy projects rather than socially transformative projects.

New Delhi Municipal Council in the Smart City Proposal (Smart City Challenge - Stage 2) has adopted a variety of citizen engagement methods to involve citizens and residents in the area (Table 2). These could be classified into two categories - high-tech engagement and low-tech engagement. High-tech engagements ranged from online consultations, multimedia presentations (MyGov, Twitter, Facebook, and its other websites) and mobile polling. Low-tech engagements included unstructured face to face interactions of officials and various groups, and *Nukkad Natak* or street plays. Impact of both high-tech and low-tech citizen engagements are unclear from the text of the Smart City Proposal (Smart City Challenge - Stage 2) of the NDMC.

What is clear about citizen engagement in the Smart City Proposal (Smart City Challenge - Stage 2) is the fact that the NDMC commits itself to the maximum public participation in setting up 'the vision and goals'. NDMC claims to "achieve informed high quality consultations, ensuring inclusion of diverse groups and communities in the city" (New Delhi Municipal Council, 2016: 19). A number of key stakeholders have been involved in the process of preparation of the Smart



Table 2: Different Methods of Citizens' Engagement by NDMC

S. No.	Methods of citizen Engagement	Involvement of Groups
1.	Face to face unstructured consultations	Interactions with 1,056 citizens that included RWAs, students, slum dwellers, traders associations, government employees, diplomats, and vendors.
2.	Face to face structured consultations	RWAs, students, slum dwellers, traders associations, government employees, diplomats, and vendors also consulted using a questionnaire administered through Tablets and fill-in forms.
3.	Online consultation	Discussion forums, polling, online questionnaires, essay writing competitions and logo design administered through MyGov.in, www.ndmc.gov.in, www.smartnewdelhi.in, twitter and the Facebook.
4.	<i>Nukkad Natak</i>	21 street plays in all major markets and slums, reaching out to large population, for effective participation in the NDMC smart city consultation process and also to spread information on key aspects of smart city initiative
5.	Multimedia presentations	Used for generating awareness with RWAs, students, traders associations, diplomats, NDMC council members and government employees.
6.	Mobile Polling	10,800,000 touch points with citizens through SMS campaign with 6,700 responses.

Source: New Delhi Municipal Council (2016: 20).

City Proposal for the NDMC area. These include hotel and traders association; diplomats - embassies and high commissions; economically weaker sections and slum dwellers; women; elected representatives; resident welfare associations; students from the schools and colleges located in the NDMC area; and the public at large. It is asserted that that 95 percent of the residents have been contacted through resident welfare associations resulting in a total of 150 hours of face to face consultations. Further 10,800,000 mobile SMS (also called touch points) were sent to 600,000 people but only 6,700 plus responses received (New Delhi Municipal Council, 2016: 19).

A number of key points emerge about the citizen engagement exercises carried out by the NDMC. First, even on an easy to access electronic platform like sending SMS through mobiles, only 0.062 percent responses were received by the NDMC, which is very low rate of citizens' responses by any standards. Second, face to face consultations in NDMC were carried out through resident welfare associations, which are regarded as representatives of the middle classes and elite groups, rather than low income slum dwellers who are treated as a nuisance (see Ghertner, 2011a, 2011b). What is strange in the Stage 2 plan is the fact that NDMC has proposed a system of volunteers to ensure citizen engagement on a



regular basis ignoring completely that people in the present circumstances are unwilling to engage with the municipality in its smart city endeavors.

Further the NDMC claims that it has constructed its 24 smart city features on the basis of the feedback provided by the residents of the areas through the processes of citizen engagement. In other words, citizen engagement has helped build vision and mission for the city, which in turn has helped NDMC in identifying 24 smart city features. These 24 smart city features of the NDMC Smart City Proposal reiterate normal problems of any city with additional label of 'smart'.

Another aspect of citizen engagement in the Smart Cities Mission is the division of marks in the second stage. Marks are awarded out of a total of 100 which are further sub-divided into three parts - city level (30), area based development (55), and pan-city solutions (15). Out of a total of 100 marks, a maximum of 16 marks could be awarded for citizen engagement. Marks decrease as one moves from city level (10), area based development (5), and pan-city solutions (1) (New Delhi Municipal Council, 2016: 6). From this sort of marks distribution, it is apparent that more marks are awarded for citizen participation for city level planning and fewer marks are awarded for project level planning and engagement.

Another aspect pertains to the Special Purpose Vehicle being set up for implementation of the Smart City Proposal in NDMC area. Although 74th amendment to the Constitution of India has facilitated decentralized urban local government throughout the country, political devolution with executive powers in the hands of elected representatives have not yet truly happened. Urban local bodies still implement policies framed at central and state levels, and do not really make policies, a critical element of any autonomous urban local government. Financial dependence of three municipalities on Government of Delhi and resulting conflict between Delhi Government and the municipalities highlights this point well. A good beginning has been made by decentralization of urban local government throughout the country, but attempts are required to be made to make these bodies autonomous with clear leadership roles assigned to locally elected politicians. A system of directly elected mayors entitled to appointing groups of professionals is required for efficiently running cities and towns. NDMC is already run by a committee of appointed bureaucrats under the oversight of Government of India. After the implementation of the Smart City Mission policies, further corporatization will manifest itself in the form of the Special Purpose Vehicle in the NDMC.

5. CONCLUSIONS

Citizen engagement in the smart city proposals is constrained by the very design of the Mission resulting in a number of 'citizen exclusion points'. The first 'citizen exclusion point' that militates against citizen engagement is the Mission's main



focus on small area projects (sometimes even referred to as smart cities) rather than pan city planning. Project centered planning excludes much of the area and population of a city from engaging with the local state. The second 'citizen exclusion point' is that citizen engagement takes place through groups like resident welfare associations, which clearly work against the interests of the urban poor further disengaging them from the state. The third 'citizen exclusion point' is that the Mission's implementation would take place through a corporate body like the Special Purpose Vehicle whose design is inimical to participation and citizen engagement. The fourth 'citizen exclusion point' relates to the Mission's technology focus that prevents the urban poor from public engagement. All the four citizen exclusion points indicate efficiency has won over equity when both could go together.

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Smart Housing for Smart Cities

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Abstract

Housing remains one of the critical problems of planning. 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. In the past it has not worked because appropriate technology was not used. Smart housing is viewed as housing for the masses that can be created efficiently and effectively if smart technology is interlinked and integrated with HFA.

1. INTRODUCTION

Government of India launched the Smart Cities Mission as a flagship program under the Ministry of Urban Development with a view to meeting the challenge of urbanization in the country (Ministry of Urban Development, 2015). As per this policy, 'smart cities' are defined as those which have provision of core infrastructure viz. water supply, electricity, sanitation including solid waste management, mobility and transport, IT connectivity, e-governance, citizen participation and safety and security of citizens. The list of smart solutions includes as many as 21 different solutions. While only 31 percent of the population of India lives in urban areas, it contributes as much as 63 percent of the Gross Domestic Product as of the year 2011 and this is slated to rise to 75 percent 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 program 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 whole gamut of things, finances are the key. This has been addressed by a huge budgetary allocation of nearly Rs.50,000 crore. This works out to Rs.100 crore for each city every year for 5 years for 100 cities. In addition to this funding which is to come from central government, funds can be also mobilized from various other sources including the private sector. In the entire process, efficiency is the key to achieving smartness. In order to achieve efficiency, use of modern technology is imperative.

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The official figure of urban housing shortage in India has been estimated to be around 25 million dwelling units (Ministry of Housing and Urban Poverty Alleviation, 2007). Out of the 24.7 million units housing shortage, a major portion belongs to the Economically Weaker Section (EWS). EWS is defined as having a family income of upto Rs.3 lakh per annum, as per the PMAY definition. By any stretch of imagination, this is a huge target which cannot be met easily. While there is absolutely no room for doubt that the housing requirement in the country is humungous, the problem is more acute in the urban areas rather than 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 where the affordability is limited. Unfortunately, the reality is that the housing being produced in the market is actually the other way round; there is very little budget housing and plenty of housing options for high income groups. This is the housing dilemma in India (Rao, 2015a). 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 habitat options.

2. 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 undertaken 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 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 (Rao, 2006).

The public sector housing agencies which were created after independence of the country to provide reasonably priced housing viz. state housing boards, corporations and development authorities have left much to be desired. The housing supply of these agencies has declined substantially in 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 has mostly catered only to



the upper incomes groups 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 governments have played into the hands of the real estate enterprise. The housing loans released by HUDCO over the last few years has shown a decline - Rs. 807 crore in 2007-08, Rs. 800 crore in 2008-09 and Rs. 771 crore in 2009-10.

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 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 has to put up with the burden of the burnt. 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 and 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 housing sector.

Government of India set up a High Level Task Force in the year 2008 to look into the various aspects of providing affordable housing (Rao, 2015b). This Task Force came up with a definition of affordable housing as (a) 300 to 600 square feet carpet area housing for EWS and LIG with cost not exceeding 4 times the gross household annual income and EMI or rent not exceeding 30 percent of gross monthly income; and (b) 1,200 square feet carpet area housing for MIG with cost of house not exceeding 5 times gross household annual income and EMI or rent not exceeding 40 percent of gross monthly income. Assuming that this is correct, if one were to look at the policies and projects being promoted by State Governments in various states of the country, one can see that few have been following the recommendations of this Taskforce.

Government of India has been pursuing orthodox policies and programs, the most recent being the Rajiv Awas Yojana to generate low income housing. 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 in this space of affordable budget housing segment and only time will tell how they are going to deliver.



3. 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 (Tighe, and Mueller, 2013). 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' (Yeung and Wong, 2003).

Post war housing in Europe is another example of strong state intervention and political will to reconstruct neighborhoods 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 is 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.

4. EFFORTS IN INDIA

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 few 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 use of age old materials and methods which are completely obsolete in the global scenario.

Transfer of technology from laboratory 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. Government of India initiated Building Centres which were supposed to promote various technologies



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 the Building Materials and Technology Promotion Council created by Government of India for promotion of technology.

The whole approach appears to be addressing the issue of housing technology in India in a very inappropriate and completely out of sync manner in comparison to what has been happening world over.

4.1 A Case for Industrialized 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!

5. 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 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 percent of the house including walls, flooring, ceiling, stairs and finishes are made in the factory. The assembly of these at site takes one day for a house to be build. Besides savings in cost and time, excellent quality and finish can be obtained.

Panelized 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 greater here. With the help of computer assisted design programs, 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 Building 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.

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. Precut 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 have 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 galvanized welded meshes. The vertical mesh wires are set along the polystyrene 'waves' thus creating reinforced concrete micro-pillars 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 inde-formable panels.

One would be quick to argue that we did try industrialized housing in India and failed. 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 was already discarded for much better technologies. It is therefore, high time that we bring about a complete shift in the fundamental paradigm of housing construction.

6. HOUSING FOR ALL (HFA) - URBAN: IS IT ENOUGH?

In order to address the issue of housing, Government of India announced the *Pradhan Mantri Awas Yojana* or Housing for All (Urban) scheme recently. In this yojana, there are four verticals or four approaches to tackle the housing problem (Ministry of Housing and Urban Poverty Alleviation, 2016). The *first approach* is "in-situ slum redevelopment". Here, the approach relies on private sector participation where developers would be given FAR or TDR and other incentives to redevelop slum areas whereby they would give housing to the slum dwellers



on a portion of the land and on the remaining, sell housing to the upper income groups to make the entire project viable. A slum rehabilitation grant of Rs.1 lakh per house is envisaged here. Essentially, in this approach, land is being used as a resource to generate funds to self-fund the entire project.

The second approach is "*housing through credit linked subsidy*". Here, interest subvention subsidy for EWS and LIG families for new house or for incremental housing. Here, the householder would get a home loan at the rate of 6.5 percent for loan amounts upto Rs.6 lakh with the house size not exceeding 30 sq m for EWS and 60 sq m for LIG respectively. Here, financial support is the key intervention.

The third approach is "*affordable housing in partnership*". In this approach, it is envisaged that public housing agencies would develop housing in partnership with the private sector. Central assistance of Rs.1.5 lakh would be provided for each EWS family.

The fourth approach is "*beneficiary-led individual house construction*". Here, if there are EWS families who own land and desire to construct houses or upgrade houses, they can approach the local body and avail of this assistance of Rs.1.5 lakh.

What is interesting to note that in addition to all the above four approaches, there is also a "*Technology Sub-Mission*" which would facilitate the adoption of modern, innovative materials and technologies for faster and quality construction.

7. EMERGING ISSUES

There are many issues that are left unattended in the above scenario. The first is that while there is an emphasis on physical infrastructure, social infrastructure has not been addressed. As a result, in the absence of schools, families may not like to shift to the new housing areas; even slum dwellers send their children to school. Second is the question of connectivity with mass public transport. In the absence of cheap bus or rail connectivity, the housing areas would remain unoccupied. Connectivity between the parent city and the distant new housing areas is imperative. The third issue is the question of availability of land for development. With the land acquisition law remaining unresolved, acquiring land for development would be a big question and the envisaged housing may never come up in the first place. Fourth is the limited availability of drinking water in urban areas. Unless macro infrastructure issues are addressed (as against city level infrastructure), it would be difficult to bring additional water to the city from distant sources along with all the appurtenances. Fifth, delays in implementation would defeat the very purpose of affordable housing, more



so in the absence of speedy adjudication processes, particularly with disputes in partnerships with the private sector. Lastly, illegal colonization which is happening in a rampant manner in all cities would still continue since the products available in such areas are always cheaper than those in the other areas. As a result of this haphazard sprawl, the basic objective of bringing spatial order and minimum level of access to facilities would remain a distant dream.

8. CONCLUSIONS

Today 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., 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 serious steps for solving the housing crisis in the country.

We need a slew of measures that can make a housing revolution happen in India. 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, and 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 subsidize. Alternatively, governments need to come out with creative models of land sharing and bring in more land in 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. Therefore, the connect between the Smart Cities Mission and the Housing for All Mission is extremely important. While there is no mandate on this, the extent



to which this connect will happen entirely depends on local governments. In the absence of this connect the proliferation of illegal land sub-division, unoccupied houses and all the other urban problems would only remain. This connect can be made possible by proper hand holding by governments.

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 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, more so in the Smart Cities Mission. One of the best ways of achieving high growth rates is by giving a strong impetus to the housing sector. Unfortunately, fiscal incentives and tax breaks are yet to be given to this sector in a big bang way to start an upturn. Unless and until we learn the lessons from success stories in our geo-political neighborhood, we will not be able to make significant progress in imparting smartness to our cities. Without smart housing, we cannot have smart cities (see Yeung and Wong, 2003).

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Transport Infrastructure for the Smart Cities

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Abstract

Relationship between the Smart Cities Mission of Government of India launched in 2015, and the smart transport infrastructure is perceived to be of critical importance for making smart cities in India. In order to realize smart transport infrastructure, major features of smart transportation infrastructure in the Indian context are discussed. A checklist for exploring alternatives of transport infrastructure is elaborated in this paper before suggesting measures for smart transportation infrastructure.

1. INTRODUCTION

Cities are engines of growth for the economy of every nation including India. Nearly 31 percent of India's current population lives in urban areas and contributes 63 percent of India's GDP. With increasing urbanization, urban areas are expected to house 40 percent of India's population and contribute 75 percent of India's GDP by 2030. This requires a comprehensive development of physical, institutional, social and economic infrastructure. All are important in improving the quality of life and attracting people and investments to the city, setting in motion a virtuous cycle of growth and development (Mission Statement and Guideline, 2015). In addition, due to climate change and other environmental pressures, cities are increasingly required to become 'smart' and take substantial measures to meet stringent targets imposed by commitments and legal obligations (ICE White Paper, 2014). Development of smart cities is a step in that direction.

The first question is what is meant by smart city. The answer is that there is no universally accepted definition of a smart city. It means different things to different people. The conceptualization of smart city therefore varies from city to city and country to country depending on the level of development, willingness to change and reform, resources and aspirations of city residents. A smart city would have a different connotation in India than say in Europe. Even in India, there is no one way of defining a smart city.

But some definition boundaries are required to guide cities in the Mission. In the imagination of any city dweller in India, the picture of a smart city contains a

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wish list of infrastructure and services that describes his or her level of aspiration. To provide for the aspirations and needs of the citizens, urban planners ideally aim at developing the entire urban eco-system, which is represented by the four pillars of comprehensive development : institutional, physical, social and economic infrastructure. This can be a long term goal and cities can work towards developing such comprehensive infrastructure incrementally, gradually adding layers of ‘smartness’.

In the approach to the Smart Cities Mission, the objective 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’. The focus is on sustainable and inclusive development and the idea is to look at compact areas, create a replicable model which will act like a lighthouse to other aspiring cities. The Smart Cities Mission of Government of India is a bold new initiative. It is meant to set examples that can be replicated both within and outside the smart city framing, catalyzing the creation of similar smart cities in various regions and parts of the country. Ninety smart cities were announced by Government of India for different states except Jammu and Kashmir. However, only 20 cities are competed for the final selection for funding in the first financial year 2015-2016 (Fig. 1). At the same time, several new smart cities such as Kochi Smart City, Gujarat International Finance Tec-City, and Lavasa - are already being developed as model cities through private sector participation (Industry Agenda, 2015).

Fig. 1: Selected Top 20 Smart Cities in India for Financial Year (2015-16)



Rather than being expensive, smart technology integration can create considerable opportunities for added value in any city. Technology integration helps cities to improve efficiency, enhance economic potential, reduce costs, open doors for new business and services, and improve the living conditions of citizens. A key condition for value creation through integration is the compatibility of technologies, which is best achieved through common and consensus based standards that ensure interoperability.

Presently, however, smart city projects have concentrated mainly on vertical integration within existing independent infrastructure and services silos, e.g. energy, transport, water or health. A true smart city requires horizontal

integration as well as creating a system of systems capable of achieving considerable increases in efficiency and generating new opportunities for the city and its citizens and smart solution as listed below.

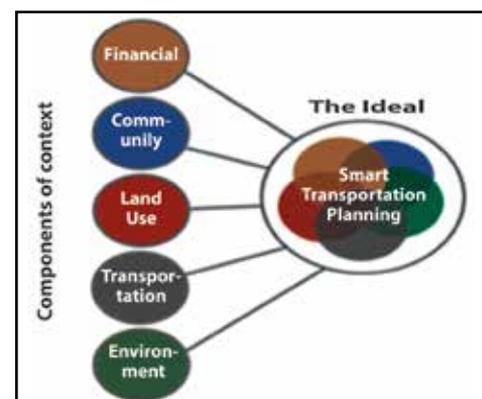
- Adequate water supply;
- Assured electricity supply;
- Sanitation, including solid waste management;
- Efficient urban mobility and public transport;
- Affordable housing, especially for the poor;
- Robust IT connectivity and digitalization;
- Good governance, especially e-Governance and citizen participation;
- Sustainable environment;
- Safety and security of citizens, particularly women, children and the elderly; and
- Health and education.

2. SMART TRANSPORTATION INFRASTRUCTURE PLANNING

Increased mobility of our societies has created intense competition between cities to attract travel trips for skilled residents, companies, and organizations. To promote a thriving culture of mobility, cities must achieve economic and financial, social in terms of community and environmental sustainability including land use which can only be made possible by improving a city's transportation infrastructure efficiency. (Fig. 2) This requires the integration of transportation infrastructure and services. While the availability of smart transportation solutions for cities has risen rapidly, the transformations will require radical changes in the way cities are run today. Transportation investments for smart cities are tailored to specific needs of each project.

The Smart Cities Mission is a bold new initiative by Government of India to drive economic growth and improve the quality of life of people by enabling local development and harnessing technology as a means to create smart outcomes for citizens. Smart solutions are bold and impactful, and strengthen the city's governance or its physical, social, or economic infrastructure. Fig. 3 shows a number of competed smart cities and their pressure in terms of registered vehicles in that state (Fig. 4). There is a four time increase in two wheelers in urban area (6.7 percent to 24.7 percent) compared to 2.5 percent growth in rural area (14.32 percent to 35.2 percent in last 10 year 2001-2011). Similarly 4.3 times

Fig. 2: Context of Smart Transportation Infrastructure Planning



(Source: *Smart Transportation Guidebook*, 2008)



Fig. 3: 97 Cities Competed for First Phase of Smart city

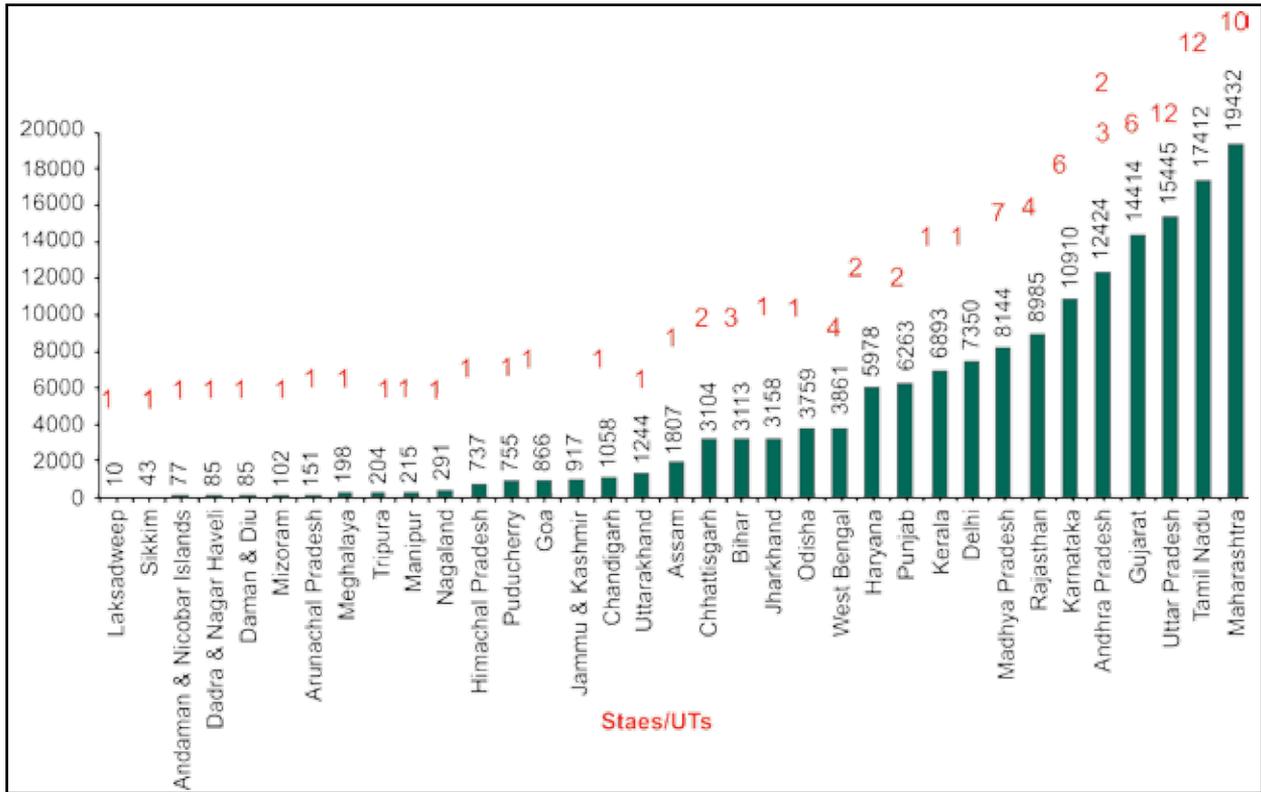
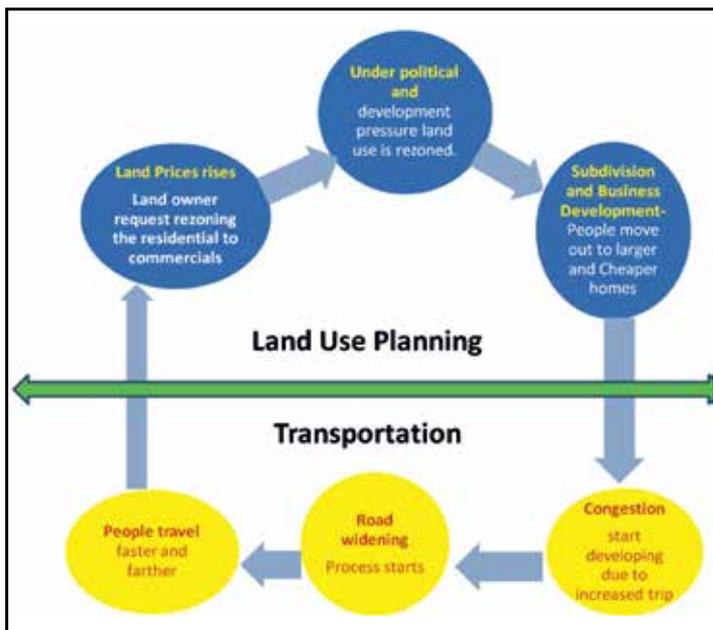


Fig. 4: Never ending chain of transportation and land uses changes



increase in four wheelers in both urban area (2.3 percent to 9.7 percent in last 10 year) and rural areas (1.3 percent to 5.6 percent).

Building wider roads and expressways are not enough. There are always constraints of resources to supply endless demands. Sprawling land use development attracts more traffic than the existing roadway capacity. There will be never ending cycle of interaction of land use development in terms of rezoning under political pressure, and traffic and transportation system. Fig. 4 also shows a cycle of interaction of never ending chain of interactions between land use and transportation activity.



2.1 Features of Transportation Infrastructure in the Indian Smart City

To break the never ending chain of land use and transportation infrastructure interactions, the following are the proposed features of smart city.

Promoting mixed land use in area-based developments: planning for 'unplanned areas' containing a range of compatible activities and land uses close to one another in order to make land use more efficient. States will enable some flexibility in land use and building byelaws to adapt to such change.

Housing and inclusiveness: expand housing opportunities for all by creating walkable localities to reduce congestion, air pollution and resource depletion, and boost to local economy, promote interactions and ensure security.

The road network: is created or refurbished not only for vehicles and public transport, but also focussing on pedestrians and cyclists, and necessary administrative services are offered within walking or cycling distance.

Preserving and developing open spaces: – parks, playgrounds, and recreational spaces in order to enhance the quality of life of citizens, reduce the urban heat effects in areas and generally promote eco-balance.

Promoting a variety of transport options: Transit Oriented Development (TOD), public transport and last mile para-transport connectivity.

Making governance citizen-friendly and cost effective – increasingly rely on online services to bring about accountability and transparency, especially by using mobiles to reduce cost of services and providing services without having to go to municipal offices and to form e-groups to listen to people and obtain feedback and use online monitoring of programs and activities with the aid of cyber tour of work sites.

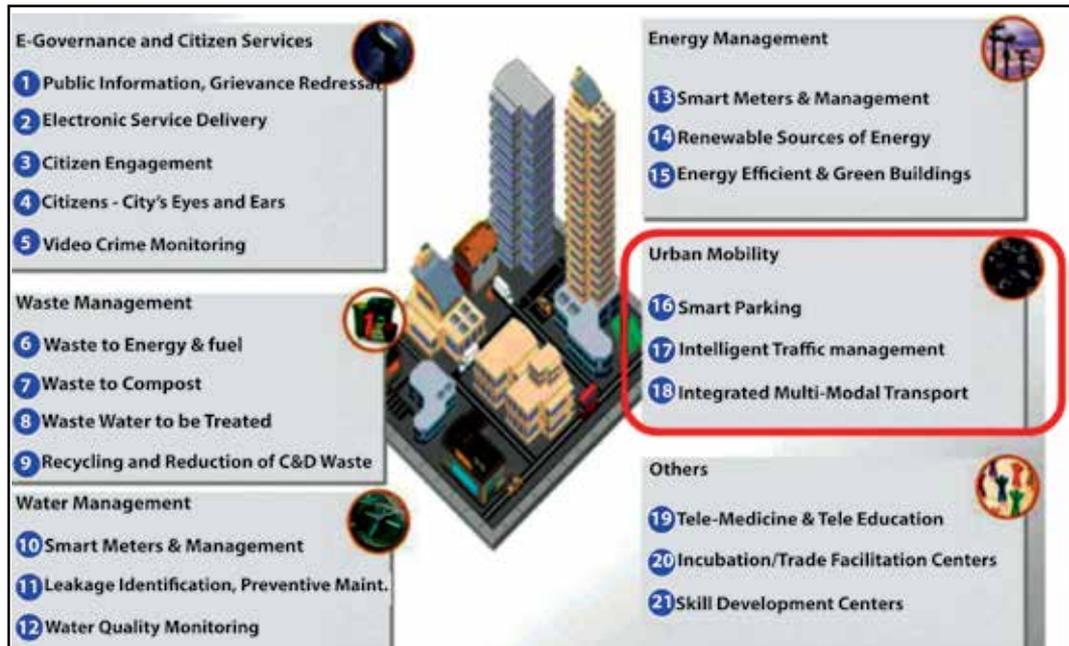
Giving an identity to the city: based on its main economic activity such as local cuisine, health, education, arts and crafts, culture, sports goods, furniture, hosiery, textile, dairy, etc.

Applying Smart Solutions: to infrastructure and services in area-based development in order to make them better. For example, making areas less vulnerable to disasters, using fewer resources, and providing cheaper services

Over all, the strategic components of area-based development in the Smart Cities Mission are (i) city improvement (retrofitting) (ii) city renewal (redevelopment) (iii) city extension (greenfield development) plus a pan-city initiative in which smart solutions are applied covering larger parts of the city. Smart solutions in terms of transport infrastructure could be proposed, which are essential features



Fig. 5: Smart Solution



(Source : Mission Statement and Guideline, 2015)

of smart city planning covering IT connectivity and digitisation, pedestrian friendly pathway, encouragement of NMT, Intelligent Traffic Management, No vehicle zones or streets, smart parking, energy efficient lighting, innovative uses of space and safety of citizens (Fig. 5).

Smart city should have centralised control system which will provide real time availability of public transport system and condition of traffic on routes. Smart city will have integrated transit corridor where bus rapid transit corridor and suburban train network are linked with pedestrian and cycle lanes. Furthermore there are pod to carry people directly from points to points with no stops at intervening stations. Smart card travel facility to travel in multiple modes of public transport. Digital parking meters will send a message to mobile app when spaces open up. Delhi, Hyderabad, Surat, Coimbatore, Bangalore, Jamshedpur, Mangalore, Mumbai and Chennai have launched initiative of advance communication system in metro network, smart meter, traffic management framework and GPRS for solid waste management and online plan approval, etc. Seven smart cities are being developed as part of Delhi - Mumbai Industrial corridor.

Transportation related criteria are one of the important Smart city level evaluation criteria. In this category a question asked from State that in the last three years has the traffic congestion eased in change of average traffic speeds, average commute times, increased pedestrian facilities, improved public transport, and lower commute distances?



3. PERFORMANCE INDICATORS FOR URBAN TRANSPORT INFRASTRUCTURE

Performance indicators for urban transport facilities in terms of presence of organized public transportation system in urban area, extent of supply, availability of public transport, average waiting time for public transport users, pedestrian facilities (percent covered in city street lighting), no motorized transport, percent of network covered in city, encroachment of NMT roads by vehicle parking, NMT parking facilities at interchange, level of usage of intelligent transport system (ITS) facilities (percent availability of traffic surveillance, percent passenger information system, percent global positioning system, GPS, General Pocket Radio services - GPRS, percent signal synchronisation, percent integrated ticketing system, travel speed of personnel vehicle, public transport, availability of parking space (on street paid public, and parking spaces), pollution level (SO_2 , SPM, Oxide of nitrogen, SPM, RSPM), integrated land use transportation system by using population density, mixed land use on major transit corridor, intensity of development city wide, intensity of development along transit corridor Floor Space Index, pattern and completeness of road network, percent of area under roads, percent of network, having exclusive ROW for transit network, total length of network total length of footpath in the city and level of service (LOS) of integrated land use transportation. Integrated land use transport system can be calculated. The assessment of city based on LOS can be done using service level bench marking standard as mentioned in MOUD Guidelines: Service Level Bench Marking for Urban Transport at a Glance (2010). This will provide insights for current standards of city and integration of land use and transportation.

This is not, however, an exhaustive list, and cities are free to add more applications. Fundamental infrastructure to deliver services such as water, energy, and transportation must be provided while making the city a desirable place to live.

Remote sensing agencies, satellite images and areal maps, regional transportation maps, census, inventories of land transit corridor, floor space index, as per new Master Plan in a city along transit corridor, road network pattern and completeness, road density, percent network with exclusive right of way for transit can be used to find overall level of service for land use transportation. Major natural and environmental systems, anticipated future context, land use and activity centers data are important requirements to calculate the Level of service of performance indicator for achieving land use transport integration in a city. Fig. 6 shows the data collection from simple steps to complex while assessing infrastructure requirements.

4. REVIEW OF SMART TRANSPORT INFRASTRUCTURE MODEL

Intelligent Transportation System (ITS), electric buses, charger with solar panel, traffic data management system, Light Rail Transit (LRT), plug in hybrid vehicle,



Fig. 6: Smart Transportation Tools and Techniques

	Mapping	Collecting & Analyzing Data	Gathering Input from Municipalities and other Stakeholders
SIMPLE ↑	Aerial Map of Existing Roadway or Bridge with 100' buffer on either side (Scale: 1" = 200')	Data from asset or performance management systems (pavement, bridge inspection, road safety audit, etc.)	Telephone calls to municipal representative and utilities
		Crash history	Meeting with municipal representatives, on site
		Roadway Function – vehicle types, pedestrian activity, bicycle activity, trip characteristics, trip types, etc.	Small group discussion, conducted on site
COMPLEX ↓	Regional Transportation Map	Major natural and environmental systems	One-on-one stakeholder interviews; conducted on site
		Existing context, land use and activity centers (trip generators)	Series of focus group meetings throughout the project area
		Anticipated future context, land use and activity centers	Meeting with regional elected officials

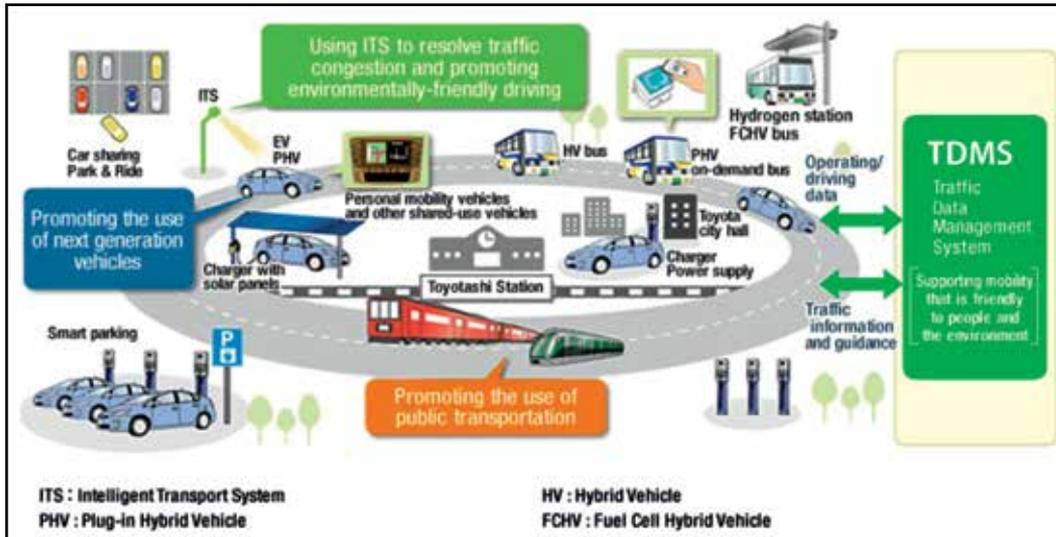
(Source: Smart Transportation Guidebook, 2008)

fuel cell hybrid vehicle, traffic information and guidance, quick charging station, car sharing park and ride, hydrogen station linked with control stations, are part of Smart Community Conceptual Model in Japan (EBA, 2015). Network of European Smart City has developed holistic view by innovation group to cover smart mobility transport and ICT, which are the transport infrastructure of smart cities promoting non-motorized transport model (Mapping Smart Cities in the EU, 2014). In Rio-de-Janeiro at Intelligent Operation Centre they installed 400 cameras for 24/7 monitoring for preventive congestion and incidence management, which is helpful for traffic, medical and weather services for citizens. Langfang city in China has installed 178 cameras for traffic surveillance, which reduce city peak hour congestion by 30 percent (One hour to 40 minutes) (Insight Report, 2013). IBM Transportation Management Center has developed intelligent transportation for integrated fare management, airport operations management, video correlation and analysis suite, fleet optimization for travel and transportation, IBM ILOG optimization solutions for travel and transportation for smart cities in the US (IBM Transportation Management Centre, 2014). Suggested typical ITS based management in corridor for smart city in India is shown Figs. 7 and 8 respectively.

5. SMART TRANSPORTATION FOR THE INDIAN CITY

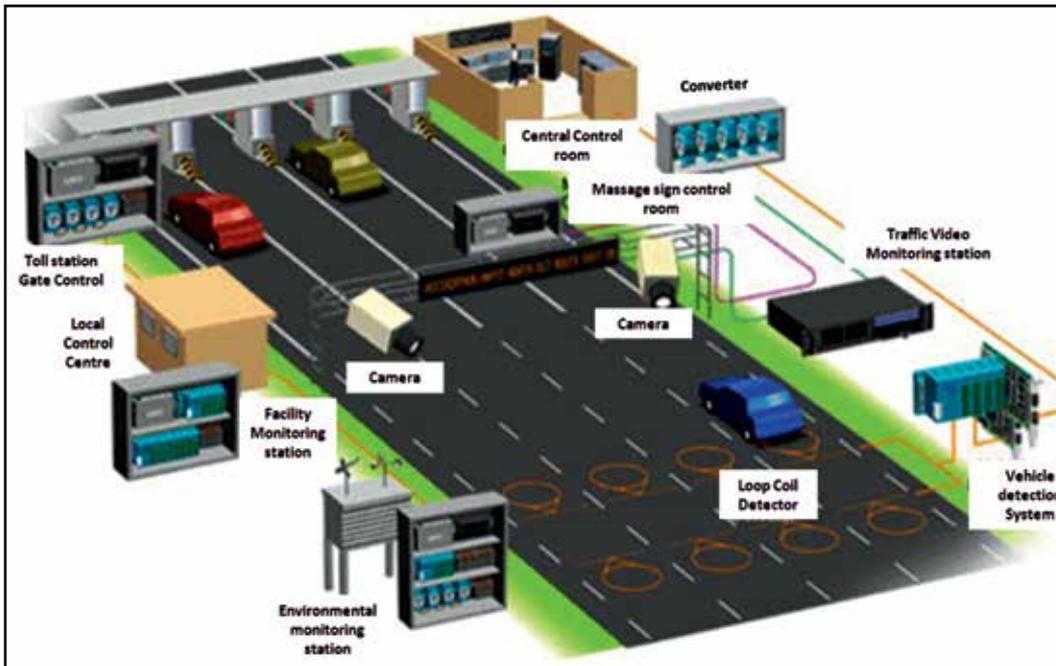
Pan-city development envisages application of selected smart solutions to the existing citywide infrastructure. Application of smart solutions will involve the use of technology, information and data to make infrastructure and services better. For example, applying smart solutions in the transport sector (intelligent

Fig. 7: Typical Transportation Infrastructure in Smart city Toytashi Japan



(Source: TOYOTA's approaches to ITS, 2011)

Fig. 8: Typical Corridor-wise Intelligent Transportation System for Smart City



(Source: TOYOTA's approaches to ITS, 2011)

traffic management system) and reducing average commute time or cost of citizens will have positive effects on productivity and quality of life of citizens. Another example can be waste water recycling and smart metering, which can make a huge contribution to better water management in the city. In India, there



is virtual non - existence of the electric and hybrid vehicle industry. There is a need to shift to electric mobility to counter depletion of fossil fuels, increase in fuel costs, and impact of transportation on the environment. Government of India has spent INR 1,400 crore (US\$ 226 million) over two years as incentives and subsidies for makers and buyers of electric vehicles as part of an effort to have at least six million electric vehicles on Indian roads by 2020. The use of bio-fuels with an ethanol-blending program to curb India's oil imports is to be accelerated.

5.1 Measures for Smart Transportation Infrastructure

Traffic safety proposal of alternative modes, and environmental and community character are important parameters for defining measures for the successful implementation of smart transport infrastructure. Details of parameters are given below:

Traffic: Peak hour level of service (intersection), screen line capacity at particular segment, volume/capacity at particular segment, corridor travel times between selected origin and destination, reducing existing vehicle kilometre travel (VKT).

Safety: Reduction in driveway, reduction in unprotected left turn, potential safety improvement at highly accident zone, appropriate median design, and appropriate shoulder design.

Proposal of alternative mode: side walk, footpath, restored side walk, safe pedestrian crossing, bicycle access, and public transportation.

Community Character: Proper alert signs for street roads, conserving park and green field, preserving town street-scape, business, residence, community facilities, land use or growth management, open space or park land.

Environmental: Wetland, stream crossing, flood plains, air and noise pollution.

Cost: Total project costs, cost per new trips, cost per new vehicle kilometre travel, cost per user.

5.2 Checklist for Exploring Alternatives of Transport Infrastructure

There are proper exploration check lists to ease main road congestion, intersection design and safety, bridge deficiency, and smart parking facilities to have smart transportation infrastructure, which is described below (Smart Transportation Guidebook, 2008):

5.2.1 Exploring range of solutions for reducing main road congestion

- Increasing efficiency on routes by signal coordination, access management, change intersection, time based changes (reversible lanes, off street parking and on street parking);



- Use alternative Transportation Modes such as walk, bicycle and public transportations;
- Increase capacity of routes by adding extra lanes, and reconfigure lane;
- Use alternative route off Routes by building new routes, redirect traffic to existing routes and augmenting existing routes;
- Manage demand off routes and on routes-travel demand Measures (telecommuting, employee transit passes, employee shuttle) and land use policy; and
- Evaluate level of service standard.

5.2.2 Exploring ranges of solutions for road resurfacing

- Resurface to current configuration by restripe, restriping by adding bicycle lane, modifying number of lanes, modifying lane width, modifying on street parking, allow for street scape opportunity;
- Evaluate the need for recycling to improve access and drainage;
- Exploring ranges of solutions for intersection congestion;
- Reconfigure at location by changing lane configuration, grade separation, roundabout, change operation at location by reconfiguring signal, restricting turns;
- Develop network at different location by construction of roundabout, flyover instead of signalized intersection;
- Evaluation around a location; and
- Implement measures around locations.

5.2.3 Exploring range of solutions for flyovers and bridge deficiencies

- Focus on structural integrity;
- Upgrade to current geometric standard as per IRC;
- Introduce roadway element;
- Restore historic character of structure;
- Use for another function i.e. vehicular to pedestrian bridge;
- Rebuild and put at another location if possible; and
- Remove.

5.2.4 Exploring by range of solution for intersection safety

- Modify intersection control based on its 2 way stop, 4 way stop, signal, roundabout, grade separation;
- Change in signal timing by extending yellow phase, modify cycle length, consider activated versus pretime, protected instead of permissive left turn;



- Modify geometry by relocating signal mast arm, add turn lanes, modify alignment, increase or decrease curb radius, evaluate / proximity of curve cuts to signal, restrict modify turning movements, review bicycle striping;
- Enhance sight line (roadside elements) - vertical and horizontal curve, relocate landscaping;
- Evaluate intersection control measures by relocating signage and moving stop bar location;
- Increase enforcement through camera and police for congestion viewing and automatic reconfigure signal timing and coordination;
- Improve pedestrian element by providing ramps, pedestrian crossing signal, pedestrian refuses, review location of bus stops, and review the marking; and
- Improve road surface and upgrade illuminations.

5.3 Need for Study and Analysis of Road Projects for Congestion Management

There is a need to study missing linkages, intersection characteristics on the roads, existing and proposed land uses, employment generation nodes, traffic and circulation patterns, condition of roads, right of ways, existing road networks and road hierarchy, freight corridors, existing and proposed carrying capacity, existing infrastructure on the roads, accident data, over bridges - carrying capacity and utilized capacity, general drainage conditions, HFL, water level, traffic analysis, traffic growth, desire line based on O-D survey, and traffic flow diagrams for effective transportation system.

5.4 Multi-modal Transportation Integration in Right Mixing Process

Need of proper vision of sustainable multimode transport integration in smart city is one of the important requirements to make cities smart. Multi modal hub and transfer station, control user information and integrated ticketing, smart payment, institutional framework, Faziilka Ecocabs Dial a Rickshaw type accessibility phase are to be integrated for complete solution from origin to destination trips.

Exploring simulation models for multi-modal integration inclusive of integration processes for mobility of handicapped, hear deficiency people, vision disable people needs for automated journey planning should be prerun to see the feasibility of transportation infrastructure scheme. Intelligent traffic monitoring, travel information system, incidence managements, congestion viewing system (ITS Strategic Plan, 2015-2019) and advance parking information (i.e. Car Silos at Auto Stads type) needs to incorporated using ICT. Apart from bus rapid transit system, provision of bike rapid transit system can be proposed, which has speeds faster than light rail, buses, or motor vehicles (STS's Transglide 2000™ bicycle transit system, 1997) to cater the per person travel space constraints in the



Fig. 9: Example of Multimodal Integration in World

City	Institutional Framework	Multimodal infrastructure elements		Integrated payment solutions
London	Transport for London (TFL)	Metro; bus; light rail; trams; taxis	iBus; Web and mobile information systems	Oyster smart card
Paris	STIF	Metro; tram; bus	IMAGE project (real time traffic information)	Navigo pass
Singapore	Land Transport Authority (LTA)	Metro (MRT); bus; light rail; taxis	Web-based and mobile (How2Go) information systems	EZ-Link; NETS FlashPay
Hong Kong	Transport Department, Government of Hong Kong	Metro; bus	Next Train mobile app; passenger information display systems	Octopus smart card
New York City	New York Metropolitan Transportation Authority (MTA)	Metro; BRT; local and express bus	MTA Bus Time	Metro Card

(Source : Akshay Mani, EMBARQ, 2014)

city. Detailed project reports should be prepared taking account of IRC, MORTH Guideline, Ministry of Urban Development Guideline including community participation (refer IRC, 52, 48, 69, 70, 86, 92, 98, 106, 12, 41, 43, 50).

5.5 Sectoral Bodies need to Increase Collaboration

Large efficiency gains from integration and interoperability can be only realized if city departments and other stakeholders collaborate effectively and agree to share information. Smart services and infrastructure cannot develop without proper collaboration. The lack of exchange of fundamental data on customers, infrastructure and operations is one of the most important barriers.

5.6 There is a need to Reform the Way Standards are Developed

The glue that allows infrastructure to link and operate efficiently is standards, which are necessary to ensure interoperability of technologies and the transfer of best practices. But standards are not yet adapted to the level of technology integration we require. Standard bodies still operate at sectoral parallel silos developing standards that are not easy to understand by non-specialists, for example, city managers. Standards are facilitators for city planners who need to incorporate them in planning and procurement. There is thus a need to reform the way standards are produced and ensure that they are adapted to the needs of the city planners and other service operators within the city.



5.7 Systems Approach in a Coherent Global Approach

There is a need for close collaboration between standard bodies themselves and collaboration with outside organizations, and particularly with the city planners. A precondition for considerable investment in, and successful deployment of, smart city solutions is a substantial worldwide agreement on what and how one would decide for and with the key stakeholders. Smart cities stakeholders need to recognize that standardization efforts will involve the development, promotion, and deployment of standard series and conformity assessment schemes that enable the implementation of smart city solutions. In addition, the multiplicity of technologies within a city now demands a top-down approach to standardization. This requires new coordination approaches between different departments in which all parts of the city are jointly considered by several technical committees involved in different organizations. This methodology is essential as systems level standards will enable the implementation and interoperability of smart city solutions (ICE White Paper, 2014).

6. CONCLUSIONS

Achieving sustainable smart transportation in a smart city is a challenging task. Sustainable transportation system should cover social, environmental, economic, land use and community aspects of transport. Proper integration and appropriate proportion of land use mix with transportation system is required in a smart city. Many smart systems have been developed world wide but decision to adopt one will depend on city requirements at local level. For smart parking using smart ticketing, smart infrastructure and video camera with sensors is useful. Improvements in roads and other components like flyovers and bridges are also needed. Intersection improvement in terms of both signal and geometry is useful way to reduce congestion. Intelligent traffic management by using intelligent transport system for entire traffic flow is the best option. Integrated multi-modal transport with proper mix of public transportation system and non-motorized transport including cycle, rickshaw and pedestrian up to disabled level is essential with smart paying options. Interoperability of data and sharing is important for increase in effectiveness in smart city.

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Smart Cities: Rethinking Urban and Rural Development, in India

Amiya Kumar Das

Abstract

This paper pleads for better planning of the Indian cities by focusing on the first principles of city planning. A focus on physical aspects of housing and infrastructure is emphasized in the paper. The paper argues for hassle free planning environment in planning agencies. Among others aspects, popularization of rental housing and high density residential development are proposed for tackling various city challenges being faced by the citizens in today's large cities of India. It is also urged that planning education should be completely modernized. These are some of the pathways to smart city planning.

1. INTRODUCTION

Bharatiya Janata Party led central government wants to develop and redevelop 98 existing cities into smart cities, which means transforming cities into high class urban centers: providing 24 hour electric supply, adequate potable water and sanitation systems, efficient mobility with public transportation and private motor vehicle, robust IT connectivity and digitalization, and affordable housing. This is a very bold and courageous step. This will require urban renewal and reconstruction of cities.

However, in this paper I want to caution about three big obstacles: outdated and non-comprehensive legislation, limited expertise at the local-level and the need for uniformity in planning laws, and the bureaucracy that limits enforcement.

The existing planning laws in India are outdated and non - comprehensive, resulting in a growing divide in urban development between India and other nations. Modern enabling legislations are very comprehensive and detailed descriptions of which topics should be addressed in the plans. These laws serve as a legal tool for implementing urban policies. The laws contain the legal basis of planning, defined general planning elements such as zoning, land uses, environmental considerations, public transportation, development impact, flooding and drainage, conservation of historic and natural resources, and other elements that advanced countries are practicing.

In India advanced planning elements and tools have not been adopted, creating a big vacuum between India and other advanced countries in urban, rural and regional planning practice. India needs to rethink their policies and develop new advanced planning laws, planning agency structures, plan implementation

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mechanisms, financing plan making and implementation, and problems of planning on private land. Therefore, a new and uniform enabling planning legislation is needed to be successful in smart city initiatives and also for planning all cities and urban renewal.

The 73rd and 74th Constitution Amendment Acts gave planning and enforcement authority to the municipalities and other local governments rather than the national government. However, local bodies often have no expertise to plan and implement. Since the local bodies have the authority to plan and enforce, and not the national government, the constitution may be amended, or some other legal means may be adopted for a uniform and comprehensive planning law.

India should adopt new uniform urban, rural, and regional development planning laws, zoning ordinance, building related codes, and planning tools compatible with advance countries. It cannot be done by individual local governments. national government has to take the lead by patronizing and taking initiatives, funding and development. The solutions depend on complete understanding of the problems and the solutions. It is not expected that the central government should know the detailed complications of planning and physical development. But it must know where to find help among national and international experts in planning legislation.

India is notorious for bureaucratic traps, delay of actions, myopic self-interests, expression of opinion without knowledge, particularly with regards to land use. The state and national governments have to overcome these ills to be successful. It is evident that the approach to development planning and execution in India is poor. Here I highlight some of the complicated challenges faced by urban development, and how urban planning can improve crime, health, poverty, and welfare through careful attention to these challenges.

2. HISTORY OF CITIES

Historically cities were built by the rulers within forts mostly by slave labors. It contained the palace, residences for the aristocrats, garrison, religious buildings, markets, and narrow roads. Colonial cities were also built for the same purpose with wider roads to accommodate horse carts and automobiles. There was no planning for the common people. They lived outside the fort cities where there was no planning of roads and facilities. This trend changed during the industrial revolution with planning for workers quarters, planned roads, water, sanitation and drainage, this was not enough.

Indian urban planning law is an extension of outdated British law. Great Britain enacted The Housing and Town Planning Act of 1909, The Town and Country Planning Act of 1932, The Ribbon Development Act of 1935 to regulate space along the highways, The Land Utilization in Rural Areas Rules, and Green Belt Act



of 1938. There were many amendments. Britain built 34 new towns as satellites to disperse population from congested London and Manchester between 1903 and 1991.

Major planning evolution began in the 1970's, and they are ongoing. In the United States, planning evolved rapidly from general city plan to comprehensive planning, urban growth management, environmental planning, sustainable planning, and growing smart (2002) campaign. These titles convey emphasis on planning and zoning with consideration to manage growth of cities, environmental considerations, sustainability of a city infrastructure and employment opportunity. Since 1980's another element has been added that is to facilitate computer and other technologies through physical or land use planning.

During the colonial rule, the British built some administrative and trading centers. The Public Works Department published *The Handbook on Town planning in 1876*. This handbook was updated eight times before Indian independence and two times after independence. Independent India probably adopted the British version of The Town and Country Planning Act of 1932. Most planning professionals have been unable or unwilling to intellectually engage in the complexity of planning technicalities. They have the mind set of the planning handbook and the Town and Country Planning Act of 1932. The handbook was never updated to catch up with the evolving planning thoughts and practices, planning laws, implementation strategies, planning tools, and planning administration. For example, we are still making colorful master plan maps. There are no detailed zoning maps to identify properties under each zone. Instead of making zoning ordinance and building codes, India simplified land use and building regulations by using building bylaws consisting of about two dozen pages. The National Building Code of India was published by the Bureau of Indian Standards in 1983. It was a good starting point, but it is not mandatory. Some municipalities enforce some parts only and others none of it. Building inspectors are not trained in building construction. Plumbing, electrical, fire, and life safety codes do not exist.

3. ENVIRONMENTAL PSYCHOLOGY IN URBAN PLANNING

Since 1960's many psychologists and urban sociologists are writing on this topic, but it is currently not practiced in urban planning in India. Proper space organization, street pattern, and orientation of plots can reduce crime and encourage friendly and healthy communities. Reducing the number of criminals will reduce cost of policing, trials, and prison. Urban and rural planning is not only about structures and infrastructures. We are building societies in communities to last for hundreds of years. Even though we plan in two dimensions, it will be three dimensional spaces after construction of buildings, structures and planting trees. Therefore, we need to understand the environmental psychology of people as we plan.



Urban forms, dimensions, functions performed, and lighting affect human behavior. Urban designers and architects design space. Psychologists classified space into categories: fixed feature space, semi fixed-feature space, and informal space. The space is also defined by: intimate distance (18”), personal distance (18” to 4’), social distance (4’ to 12’), and public distance(12’ to 25’). In auditoriums and public meetings personal distance is necessary to prevent stampedes, claustrophobic conditions, pick pocketing and crime. We need to build defensible spaces. Therefore, spaces provided, designed, and constructed need to consider these issues.

Street pattern and orientation of plots affect public safety and health. Urban planning in India has not paid attention to these aspects. Haphazard roads disorient people. Uniform grid pattern of our cities “make strangers as much at home as the oldest inhabitants” (Lewis Mumford, 1961). The grid patterns of streets give easy access to strangers, burglars, and criminals. Because of this reason in residential areas in big cities in India, burglaries occur during day time when the inhabitants are gone to work. Cluster developments with limited access are safer. Super blocks, as created by Le Corbusier in Chandigarh, but larger in area, with a central park, play field, school, community hall, convenient shops, and housing clusters around the central park could be a self contained residential area where children do not have to cross major roads. This can be a community (village) to spark social activities, community feeling, and leadership development. Finding an address easily is important for visitors, utility department, law enforcement, mail delivery, and medical emergency. In Kolkata and Japan properties are numbered according to the date of construction and frustrating to find. Serial number with even numbers on one side of the road and odd number on the other side is much easier. Recently I mailed a letter to a government office in Pune. There was no street name and number. It contained 29 words and groups of numbers.

Orientation of roads, plots and buildings on the northeast- southwest and northwest- southeast axis is most desirable. This maximizes sunlight around the buildings. North-south and east-west orientation cast a triangular shadow on the north, which makes the north side damp and unhealthy. No plants grow there. Ildefons Cerda introduced NE-SW and NW-SE axis orientation in an area of Barcelona in 1854. Greek planner Dioxides also introduced the same axis in the Islamabad Plan in 1962. Consideration of wind direction is also important, but it varies depending on geographic location, hills, large water bodies, and tall buildings.

4. HOUSING CRISIS

All over India there is a shortage of housing for middle and low income families. There are 65 million slum dwellers. Even for higher income families,



prices are high and there are not many options. The genesis of this problem is the migration of people from rural to urban centers for employment. The government has unsuccessfully tried to solve housing problems in several ways through legislation.

- Occupancy right: Laws that favor tenants whereby the owners cannot increase rent and cannot evict tenants. Occupancy rights have resulted in several undesirable effects where many owners rent for 11 months and may renew, resulting in less certainty for tenants; tenants often need to pay a big sum as *purgery* with the income from rents, owners cannot afford to repair rental property and pay municipal tax. Therefore, such properties are deteriorating and there are frictions in the housing market. Many homes are empty or under occupied, but will not be rented out of fear that tenants cannot be evicted in the event of default or misbehavior.
- Rental housing apartments are not built in India. It is a risky business because of unfair government laws prohibit eviction and rent increase. These hurdles should be removed. Availability, size of apartments, construction costs and location will determine rents in a competitive environment. The private sector can build apartments. It could be a profitable business. During construction, millions of workers could be employed such as concrete workers, plumbers, electricians, cabinet maker, painters, engineers, building material manufacturers and suppliers, property management people, etc.
- There are hooligans who occupy vacant private and government land overnight. They build temporary shelters and slums. Eviction is a big problem. Some politicians give protection to the illegal occupiers in exchange for their votes. It also becomes a headache to the municipalities in deciding whether to give building permit on occupied land. Through forgery and other unfair means many of them get building permits. Another type will rent a residence, but default on payment of rent, but will not vacate the place. The occupancy laws are in favor of hooligans. This is an abrogation of property rights granted by the constitution.
- Land Ceiling Act forced the owners to sell large land holdings. Now, there is not enough land for their progeny or to do mechanized cultivation.

Besides making new urban planning laws, Government of India must amend the existing regulations on occupancy and land sales discussed above. These hindrances must be removed for proper urban development of cities and villages.

5. POPULATION DENSITY

The high population density can paralyze a city without wide roads, wide bicycle lanes, wide pedestrian walks, public transportation, reliable water supply, sewerage, and electricity. India's large cities have 520 to 2,080 persons



per sq mile density; Europe's large cities have up to 520 persons per sq mile, and the Northeastern United States has 1,040 to 2,080 persons per sq. mile in densely populated urban areas. Big cities in Japan have more than 2,080 persons per sq mile. India may consider 1,500 persons maximum per sq mile population density in big cities because many households become crowded and permitted density will exceed. Population density is controlled by zoning ordinances. A reasonable gross square feet area is established per person for office, residence, and other uses. From this, number of persons per building can be estimated.

- In heavy rain fall, a city may have floods in lower elevations. Large storm water drains with proper slope, storm water holding tanks, and disposal to rivers is required. The drains should be open to the ground such that water can percolate to the water table. Garbage collection and disposal is a big problem in Indian urban areas. If there is no land in the city limits for a garbage dump, the city can buy or lease large parcels of land outside the city limits. Make sure garbage dumps are located far away from water bodies to prevent pollution of water. Green spaces and storm water retention ponds are needed in every land development for percolating water to the water table and flood prevention downstream.
- While building high rise residential buildings, caution should be taken that these buildings are not human warehouses. In Chicago many subsidized high rise housing buildings were built for the poor. The design and space were cramped and crime increased; children had no place to play. Ultimately these buildings were demolished.
- High population density can also have important environment consequences. When we talk about environment it includes ecology, natural surroundings, manmade structures, and environmental psychology. Trees, water, green playing fields, parks and gardens bring soothing effect to the residents and better quality air. People cannot live in a jungle of concrete and asphalt, which absorbs heat from the sun.
- Europe has 720 million people and densely populated in large cities. The rural areas are less populated. Agricultural land and natural resources are protected. European cities are rich in history, architecture, and artistic treasures. All of them have very large parks, green spaces, lakes, and efficient public transportation, museums, and opera halls. They preserved old buildings and used modern architectural buildings, using prefabricated components with light weight but stronger materials. Such buildings can be constructed in short time and hence less cost.

The older buildings in European cities have some characteristics. Those were built around the city blocks facing the streets. In the center, there is a garden



and fixtures for children to play and benches for adults. Almost all of them are five stories and have no lifts. Those were built before the lift was invented. Residents do not mind taking the stairs rather than walking farther distance. Even the new apartments are 4 or 5 stories with lifts. It may be true that 90 percent of the people live in apartments. Single family homes are few and most expensive. On the other hand, in the United States most families live in the suburbs in single family homes and have low density.

In Europe people walk several miles a day and thousands commute by bicycles covering 10 or 20 miles. There are special bicycle lanes and parking stands where they can lock cycles. Few overweight people were seen, they remain active and healthy.

6. MEGA CITIES

Population has grown to 22 million in Delhi, 19 million in Mumbai and 14 million in Kolkata. There are 14 other cities which grew to between 2 and 9 millions. This limitless growth causes many problems such as providing utilities, transportation, educational facilities, police protection and public amenities, and financing and management. Further growth should be discouraged and we should concentrate on improving the currently existing cities. Migration to large cities cannot be stopped by any law. But it can be drastically lowered by distribution of economic development to smaller cities and towns.

All cities have a carrying capacity, just like trucks have. If overloaded, it will break. The infrastructure and amenities of a city is designed and constructed to a certain population size. Beyond these population limits, infrastructure and amenities need to be expanded, which is very expensive. The cultivator land owners around the expanding cities are exploited. They enter into agreements to sell land at the current price, but actually sales documents are made several years later when the price is much higher. The seller spends the money to build a bungalow, car, and luxury items, and in a few years they are back to poverty.

Instead of further growth, urbanization and economic opportunities should be distributed to regional cities, sub-regional cities, and market towns. Walter Christaller formulated his Central Place Theory in 1933 and encouraged creating a hierarchy of cities. Mahatma Gandhi said "India lives in villages, only when villages advance, India will advance". He also asked to take the jobs to the people and not people to the jobs, dislocating them. President A.P.J. Abdul Kalam stressed a reverse flow of population from urban to rural areas in 2002. These three wise men's advise needs to be implemented. The rural population can commute to the towns without migrating to big cities. If this is done, slums will not be created in cities.



7. FREE LOADERS

The tax rate of municipalities is low and some property owners evade taxes. This leads to fiscal deficits, such that municipalities cannot afford to provide the municipal services with the property tax money. Sales tax and income tax money generated in municipalities goes to the state and national governments. Municipalities heavily depend on state and central governments for financial aid. Fiscal health of the urban and rural areas should be improved by sharing these taxes with the local governments. Another principle is who creates the need must pay for it. That means the costs of capital improvement projects such as new water lines, widening of roads, etc.; must be shared by property owners benefiting from such developments. A fiscal sanity and responsibility of the residents must be developed.

8. EMPLOYMENT-ORIENTED EDUCATION

Growth in India implies development and construction. There is a shortage of skilled workers in the construction sector. On the other hand there are millions of unemployed non-graduates, arts graduates, and postgraduates. India must educate young people where construction skills are required such as reinforced steel workers, concrete workers, brick workers, carpentry and cabinet makers, painters, steel grill and door makers, expert lock installers, plumbers, electricians, security system installers, building code plan examiner, building inspectors, plumbing inspectors, electrical inspector, surveyors, etc. Training should be conducted in vocational schools in a commutable distance all over India. The venture colleges and some school buildings may be converted for such education. Some of these skills do not need even a high school diploma. Ability to read instructions and read drawings is good enough. Every person is good in some skills, and skilled craftsmen have the potential to earn as much or more than college graduates, only they need the opportunities.

9. PLANNING EDUCATION

Indian planning education is antiquated and no longer suitable for modern urban planning philosophy and practice. There is no Indian model or foreign model of planning. It could be called a human model of planning, if somebody insists for a model. This means that recent planning thoughts include human and surrounding environment, economic development, social psychology, needs of the human society, sustainability of the human society, and variations of local topography and culture. A good medical doctor enriches his knowledge by reading journals on the latest research, inventions, cures and methods in medical science in the world. Then he applies those in practice. Urban planners in India are not keeping up with new approaches to planning developing daily worldwide. We cannot stand still in a moving world.



Planning education curriculum must be upgraded in all planning schools in India and full time scholarly professors must be hired. The libraries must have selected books for conducting research. These schools should be top learning and research institutions. The curriculum must include planning laws; zoning ordinance; geographic information system (GIS); history of planning evolution; planning principles and theories; data collection and analysis; planning practice and administration; planning projects with mapping, graphs and power point presentation; lectures and seminars from scholars around the world.

Emphasis should be given on planning laws and GIS. These are very special subjects. Planning law is the basis and means of planning requirements and enforcements. The persons writing a planning law require knowledge on both planning and laws. With the help of GIS, existing land use, buildings, land contours, minerals, forests, rivers, roads, even the illegal constructions can be monitored. In urban renewal projects such as road widening projects, existing width of roads, buildings that need to be demolished, alignment of roads, drains, etc.; can be determined from GIS maps. No survey is required. The planners need to have this knowledge, even though they may be assisted by GIS professionals.

10. PLANNING ADMINISTRATION

Planning officers and consultants make the plans and development authorities or municipalities implement these plan and building codes. Planning offices should be given the authority to monitor compliance. Governments generally appoint IAS officers or influential politicians as the heads of these agencies. Both types of officers are not trained in planning. This creates inconsistency between technical knowledge and implementation. Moreover these IAS officers are transferable within short time. The agency heads need to be trained in planning and should stay for a longer period of time to develop expertise. Temporary positions, unskilled employers and employees, non-dependable workers, and favoritism will defeat the purpose of planning.

11. CONCLUSIONS

Everything occurs on land and water such as human settlements, economic developments, forests, minerals, water bodies, floods, transportation, electricity, satellite communication, etc. We have a national emergency to plan land and economic develop for over one billion population. Each hierarchy has different focus and going from a whole to parts. We should plan for national comprehensive natural resource planning and utilization. Regional land planning, town and city planning, rural land planning, new towns planning, and urban renewal should top planning agenda.

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Emerging Smart Cities in India: Is it a Roadmap for Sustainable Urban Development?

Anupreet Singh Tiwana

Abstract

The utopian concept of smart city is being advocated by the industry-led consortia as a human settlement where ultra-modern technology comes to the rescue of every urban challenge. The smart cities will include both the upcoming cities and existing one; the ancient and heterogeneous existing cities will come under the preview through the help of technocratic makeup. However the Paper white summing up highlights that the upcoming smart cities will be best suitable for technologically literate population and might be less suitable for senior citizens, subalterns, poor and physically challenged residents. India needs not just the 'smartness' from the information technology sector but a range of town planning, civil engineering, material sciences, architectural sciences and technology disciplines need to be amalgamated into a convincing, comprehensive and well-connected smart city plan.

1. INTRODUCTION

Smart city seems to be the urban buzzword after the release of BJP National Election Manifesto, and earmarking of seed money of Rs. 7,060 crore for developing 100 smart cities in the central budget of 2014. The utopian concept of smart city is being advocated by the industry-led consortia as a human settlement where ultra-modern technology comes to the rescue of every urban challenge. The notion is based on eco-friendly cities that take advantage of technical skills to offer a more structured and qualitative liveable environment. Interestingly, 'infrastructural smartness' will engulf both statutory and non-statutory urban centers of India. Similarly, the model of smart cities will include both the upcoming cities and existing one; the ancient and heterogeneous existing cities will come under the preview through the help of technocratic makeup (Harris, 2015). The notion of smart can be seen to personify specific characteristics that include digital infrastructure, limitless usage of ICT, high-tech pollution free urban industrialization and promotion of environmental and social sustainability (Tranos and Gertner 2012). Smart cities, what they could and should appear like, are the focus of on-going debate in the academia and this new urban morphology needs to be explored as the interplay of the conceptual and the material related to smartness of cities is experiencing the phase of paradigm shift in studies of urban India. The genesis of the contemporary smart city deliberations spurt out of the multiple policy failures and urban crises such as economic, environmental,

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industrial capitalism, security, degrading quality of life and unsustainable urbanism (Hodson and Marvin, 2014; Sadoway and Shekhar, 2014).

The rise of ICT enabled networked societies, cities and governance vis-à-vis intensifying influence of internet and wireless revolution has driven a persistent curiosity in smart urban centers (Castells, 2008; Townsend, 2013). The GIS and GPS integrated smart transportation systems in Mumbai have cut average travel time by 12 percent; this pioneer 'smart' project encouraged the growth of smart infrastructure and also boosted the aspirations of investors and consumers in India (Dobbs and Remes, 2015). Understanding, rethinking and reconstructing cities of developing realm through the prism of technology is increasingly adequate and relevant when global and digital forces have become the part and parcel of urban milieu (Sassen, 2007). Urbanization influences on all aspects of society and economy and its growing connections with technological revolution made socio-economic process more complex and interesting (Jha and Tripathi, 2014). Cities in India have their own requirements and peculiar limitations. Therefore, they necessitate public centric strategies, appropriate and economically viable technology and funding mechanisms.

The advent of modern electrical and electronic technology accelerated the rate of change in public as well as private spaces to a pace measured in fraction of seconds and these hi-tech based transformations involve complex imbrications of the digital and non-digital and between global and non-global resulting in destabilizing existing urban hierarchies and rescaling new urban order (Graham, 2004; Krause and Petro, 2003; Sack, 2005; Sassen, 2006). Importantly, the international smart city technology market is estimated to grow from \$ 8.8 billion in 2014 to more than \$ 27.5 billion by the year 2023. In India, the internet user population is estimated more than 190 million in 2014 and is growing rapidly (Navigant Research, 2014; Singh, 2014). On the other end of the spectrum, urbanization is peaking in developing world at a time when capacity to govern this phenomenon is still in limited supply, and it is the situation of 'peak urbanization, weak capacity' (Fuller and Romer, 2015).

Systematic literature review about the smart city has been carried through eight phases i.e. (i) Time analysis to highlight the trends and related causes during last 14 months; (ii) Terminology analysis to know the roots of the idea of smart city; (iii) Definition analysis to suggest the appropriate definition for smart city; (iv) Typology analysis to know the possibilities, applicability and limitations; (v) Spatial analysis to explore the potential spatial patterns and resulting changes in urban morphology; (vi) Geoinformatics and GIS analysis to investigate the gaps between 'technical utopianism' verses GIS enabled smart city; (vii) Geopolitical analysis to know the implications on diplomatic relations; (viii) Policy analysis to recommend improvements for social welfare and for proper implementation.



Concerning methodology, the paper is based on the scrutiny of current policy documents and promotional materials related to the smart city plans produced by the Ministry of Urban Development, various reputed journals and newspapers. The present paper is based on secondary sources and diverse theoretical frameworks related to smart cities. The analysis is highly influenced by the notion of 'subaltern urbanization'. The paper is an endeavour to highlight the importance and applications of GIS in the field of smart cities.

2. APPLICATIONS OF GIS IN SMART CITIES

Geographic Information System or GIS integrates hardware, software and all types of data for capturing, organizing, analyzing, and cartographically demonstrating all forms of geographically referenced information for a smart city. GIS has the exclusive capability to amalgamate data from numerous sources, display them visually using geography (space) as a common element of these data sources and helps in understanding patterns and relationships between these data elements (ESRI, 2014). Thus, information collected, provided and presented by GIS enables the urban planners for developing new smart cities as well as converting the existing cities into smart settlements. GIS emerged as a broad term and a complete package, which can denote a number of modern technologies and advance processes and become mainstream that expands information about urbanization and associations among people (Tiwari and Jain, 2014). The citizens can share their grievances, comments and suggestions through geo-informatics; and beyond the advantage of e-governance GIS proves to be helpful in participation of citizens in decision making and functioning of any city. In nutshell, GIS can be leveraged in the areas such as smart urban planning, smart utilities, smart transportation, smart public works and citizen engagement (ESRI, 2014).

3. DEFINING THE SMART CITY

Hettner (1927) is of the view that reality is three dimensional, which must be examined from three different viewpoints (systematic sciences, historical sciences and geography) for comprehension (Hartshorne, 1939). While defining 'smart city concept', it is the prerequisite to follow multi-dimensional and multi-disciplinary approach as smartness in a city means different things to different residents and this is the reason that smart city embraces more than a few definitions depending on the denotation of the word 'smart': intelligent city, knowledge city, ubiquitous city, sustainable city, ultra-modern city, digital city, etc. (Cocchia, 2014). While reviewing the literature it appears that smart city and digital city are the commonly used terminologies to document smartness of urban centres by the scholars. For different people, it could be smart design, smart utilities, smart housing, smart mobility, smart technology, smart and affordable living, quality of life, etc. (Ministry of Urban Development, 2014). The



umbrella of smart city encompasses almost everything and aspects from smarte - governance, smart leadership, smart business environment, smart people, smart job opportunities to smart urban infrastructure (Harris, 2015). Due to the above mentioned nomenclatures prevalent in the society, a number of definitions survive and trying to prove to be the best, but not a single definition has been unanimously recognized and accepted yet.

Smart Cities are those urban settlements that are capable of attracting investments, have good infrastructure, simple, user-friendly and translucent online processes that make it easy to establish an entrepreneurship. The British Standards Institute (2014) defines it as “the effective integration of physical, digital and human systems in the built environment to deliver sustainable, prosperous and inclusive future of its citizens”. Smart Cities are those which have smart, modern and intelligent physical, social, institutional and economic infrastructure. It is anticipated that such a smart city will produce options for a common man to pursue his living and wellbeing meaningfully. The notion of smart city aims at competitiveness (refers to a city’ scapacity to create employment opportunities and attract capital), sustainability (includes social sustainability, environmental sustainability and financial sustainability) and quality of life (includes safety and security, inclusiveness, recreation, access to services, affordable and best healthcare, quality education, and opportunities for participation in governance).The four pillars of the smart city notion are: physical infrastructure, social infrastructure, institutional infrastructure and economic infrastructure.

Smart Cities would be facilitated by a number of instruments such as green and clean technology, optimum utilization of ICT, maximum participation of private sector as well as citizen participation and smart administration or e-governance. Smart cities aspire to offer steady utility services, sanitation, solid waste management, storm water drainage, energy efficiency and better access to information. Similarly, smart cities will need a professionally trained workforce, hi-tech urbanites and a number of decision support systems for functioning. Thus, there is a dire need for a mass level capacity building programs that must include GIS training, research, knowledge enhancement, technical and vocational education system, digital mapping and a rich data base.

Smart cities will incorporate all state capitals and union territories. It will also include 44 cities with population range between 1-4 million people, nine satellite cities with a population of 4 million or more, 10 cities that are of religious and tourist importance and 20 cities in the 0.2 to 1 million population range (Khanna, 2014). The Draft Note on Smart City Scheme prepared by Ministry of Urban Development (2014) elaborates that comprehensive lens is taken in



identifying potential smart cities, taking into consideration economic growth, political framework, execution capabilities as well as positive externalities of clusters and urban agglomerations.

4. SMART CITIES WITH GEOPOLITICAL IMPLICATIONS

Prime Minister Narendra Modi while elaborating his vision for 'Digital India' said in his speech in June 2014: "Cities in the past were built on riverbanks. They are now built along highways. But in the future, they will be built based on availability of optical fibre networks and next-generation infrastructure". Narendra Modi led central government is religiously working on its ambitious flagship project of developing one hundred smart cities with main funding from private sector and abroad.

Interestingly, smart cities find no mention in central budget for the year 2015. However, an amount of Rs. 2,510 crore has been earmarked under the head 'Digital India Programme and Telecommunications and Electronics Industries'. The onus of smart cities development project is on private sector, foreign aid and multinational companies. The High Power Expert Committee on Investments estimates that per capita investment cost of Rs. 43,386 for 20 years period is required. Their estimates cover water supply, sewerage, sanitation and transportation related infrastructure. It is expected that most of the infrastructure development will be taken up either as private investment or through PPP. It is important to note that the contributions from Government of India and the states or urban local bodies will be largely by way of viability gap support (Ministry of Urban Development, 2014). Urban development is a state subject according to the Constitution of India. In the case of smart city scheme, central government is ready to play an important role in facilitating policy formulation and capacity building and more or less silent on other functions.

First of all Singapore Foreign Minister on his visit to India offered to develop one smart city followed by the British Chancellor extending 1 billion pound credit line to help U.K. companies to invest in Indian infrastructure (Singh, 2015). Japan and India signed an MoU to convert Varanasi into smart city by using the experience of Kyoto. United States also signed an MoU to give a momentum to the smart city scheme by extending support to develop three smart cities i.e. Allahabad, Ajmer and Visakhapatnam. Soon after U.S. and India agreement, Germany also extended his support in developing three more smart cities. This year Republic Day Chief Guest, President Obama reassured India to develop three smart cities. Likewise Spain also came forward to develop Delhi into smart urban centre, and in the near future both the countries will sign an agreement. During his recent visit to France, Prime Minister got assurance to get necessary help for developing



smart cities. France offered its expertise, men and material for Puducherry, Nagpur and Chandigarh. Smart city models from Korea, Canada, Nordic countries and Dubai have been heralded (Harris, 2015). Easing of norms for foreign direct investment is already in pipeline.

IT and infrastructure developing industries like CISCO, IBM, Hitachi Data Systems, Nokia - Here, HP, Godrej and Boyce Ltd., Tata Strategic Management Group, KPMG, Deloitte India, McKinsey Global Institute, Siemens and Apex Avalon Consulting, PWC, ILFS, WIPRO, Accenture, TCS, INFOSYS, Mahindra Tech, etc.; have been eyeing smartly for potential related to this project in India. Most of these corporate houses and companies are MNCs and will try to maximize the throttle to achieve the goal of national program of 'Make in India' through the smart cities. The Draft Concept Note published by the Ministry of Urban Development (2014) also highlights that greater involvement of the private sector enables higher levels of efficiency. Interestingly, it is also mentioned that detailed guidelines for doing so will be developed in the near future.

Historically, the cities of Indus Valley Civilization (3000 B.C.) had highly advanced system of town planning. Even during the Vedic Period, town planning was done on scientific footing as mentioned in ancient sacred books like 'Viswa Karmaprakash' and 'Mansara Silpashastra' (Hiraskar, 1993; Rangwala *et al*, 1998). It is time for India to widen the canvas and at the same time to explore and exploit great engineering and software talent available at local level rather than to import strategies from global north, only then smart cities can acquire autonomy and capacity for betterment of their citizens leading to sustainability. Most of the existing cities of India follow early twenty century European town planning approaches and models, and are unable to address the rising poverty, informality, peripheral sprawl and inequities as inherited through these planning systems and approaches (Watson, 2009). The key question is whether India (which remained the colony or protectorate of Britain) should follow the path shown by European planning processes? Or is it the right time to develop local knowledge. Whether this 'game of smartness' is just the high-tech clothing of urban entrepreneurialism needs to be understood. Hence, in the contemporary situation the relevance and viability of new imported model is quite doubtful.

Ayona Dattain in her research paper titled "A 100 smart cities, 100 utopias" reveals that smart city parameters modify each day in India with new towns added or subtracted from the tally; similarly, new committees envisage new ideas and policy notes drafted and redrafted and Indian media awash over the last two years with rumours (Datta, 2015). The High-Power Expert Committee on investment estimates that the annual fund requirement for smart cities will be Rs.35,000 crore and this amount will cover water supply, sewerage, sanitation



and transport-related infrastructure (Khanna, 2014). Besides, a large chunk of the finances will come from private investments. Under this scheme, this amount shall be covered by complete private investments or through public-private partnerships. Ministry of Urban Development has not yet finalized the road map regarding the sources of finance.

An analysis of the blueprints of the so far published documents by the Ministry of Urban Development presents heuristic picture. Of foremost importance is the role of the state, which will be completely on the back portico in the near future. An important question arises about the motivations behind the emerging smart cities as they are the universal phenomena that businessmen are mainly interested in the moolah, and are least interested in the welfare of residents. It is rapidly becoming the right of the corporate sector to extract and accumulate maximum capital from the smart cities; they are least concerned with the subaltern masses (Marcuse, 2009). The frequent visits of Indian and foreign delegations to promote smart cities also throws light on the important issue of the Indian state, which is navigating away from welfare approach to neo-liberal urbanism and neo-colonialism through FDI in infrastructure sector under the influences of globalization (Datta, 2015).

5. SMART CITY: NOT SO SMART IDEA

The ICT revolution is acknowledged as a 'game changer' in the direction of smart cities. No doubt technologies are social constructs with a series of positive and negative effects on human life (Vanolo, 2014). The prominent question before policy experts and scholars is that there is little room for the technologically illiterate, the poor, the subalterns, and aged population who did not find any clear role in the contemporary smart city discourse. From the Foucauldian perspective, the smart city model is a forceful tool to create pseudo smart citizens who are compelled to be highly technologically literate. It is also worth mentioning here that the blueprints of smart city plan hints towards the slow poisoning of the welfare system of Government of India. Similarly, smartness will surely intrude in private life of an individual. David Harvey while expressing his views regarding the possibilities of imagination and utopia commented that over use of technology will restrict the potential imaginative planning approaches in the coming future (Harvey, 2000). Likewise, Alberto Vanolo emphasized on the studies and considerations regarding the emerging relationships between technology and politics in smart cities (Vanolo, 2014). For 30 percent BPL population who can never think of affording the smartness of Lavasa, GIFT, Aamby Valley, Dholera, Nano City, etc., it appears like a dystopia come true (Trivedi, 2014). Smart cities are part of the dream and aspirations of youth (mainly software engineers, middle level entrepreneurs, public relations consultants, advertising professionals,



management professionals, students of professional courses, etc.) who are highly influenced and mobilized by globalization (Datta, 2015; Roy, 2011). The smart city concept implies an over simplified mental picture of technology, and it is also based on the principle that technology can solve any dilemma without fundamentally changing lifestyles (Kajaria, 2015).

6. CONCLUSIONS

Although the process of transition from countryside to city is filled with economic, social, cultural and political promises, urbanization still holds the enormous potential of transforming the under developed countries into prosperous regions by creating employment opportunities and lifting millions out of the vicious circle of poverty, illiteracy and disease. The smart city is presently a generic and optimistic notion for the city of the future and in fact no appropriate definition has yet been structured. The notion of smart city can be seen to personify specific characteristics that include digital infrastructure, limitless usage of ICT, high-tech pollution free urban industrialization and promotion of environmental and social sustainability (Tranos and Gertner, 2012). The term smart city is basically an evocative slogan lacking well defined conceptual core, and in this sense proponents of the smart city are permissible to use the phrase in ways that support their own agendas (Vanolo, 2014). Prime Minister Modi's '100 smart cities' mission has been a subject matter of praise as well as critique within the urban policy circles in India and abroad. It is receiving criticism due to lack of lucidity in the hallucination and its disrespect for perennial urban challenges of Indian cities like, poverty and exclusion (Shiraz, 2014). Even the potential investors are losing patience due to lack of clarity. Optimum utilization can only be done by assuring that accurate infrastructure is built, existing infrastructure is used efficiently, infrastructure projects are delivered proficiently, and private partners along with welfare state are included (EPC World 2014). No doubt the upcoming smart cities will be best suitable for technologically literate population and might be less suitable for senior citizens, subalterns, poor and physically challenged residents. India needs not just the 'smartness' from the information technology sector but a range of town planning, civil engineering, material sciences, architectural sciences and technology disciplines need to be amalgamated into a convincing, comprehensive and well-connected smart city plan.

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A 'SMART' Development Plan, Integrating People and Technology

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Abstract

Based on the principles of inclusiveness, participation, coverage and concern, action linkages, and technology, this paper attempts to connect smart people with smart technologies in a smart city in order to obtain several these equity outcomes. A model to prepare a smart development plan is also developed to move in this direction. A number of key technologies such as GIS, GPS, remote sensing, cloud computing and other ICT are briefly described to prepare a smart development plan.

1. INTRODUCTION

Development Plan (DP) is an accepted tool to institutionalize planned interventions in urban areas. The approach, scope, methodology of DP varies across countries political, administrative and other contexts. In India, 'planning' as an essential function of urban local bodies (ULB) was recognized first in the 74th Constitutional Amendment Act, 1992. Later City Development Plan (CDP) was introduced through, JnNURM in 2004. In last about thirty years, India experienced multiple learning stages of city planning. Recently with the announcement of 100 smart cities in India, a different and enhanced attention has emerged for planning of smart cities. Consultants will be given responsibilities for preparing smart cities' DP under proposed new special purpose vehicle (SPV) to be formed for each city (Ministry of Urban Development, 2015).

In this situation three relevant concerns arise and those need to be addressed. These are (a) DP interface with smart city concept, (b) integration of technology and people in planning phase and (c) role of ULBs in the planning. The approach in planning starting from 74th constitution Amendment changed from time to time and influenced the capacity of ULBs at large. It is a challenge to ULBs to respond to different planning framework from time to time with the change of government policy. A standard format that can address the smart city planning for the present as well as take care of the future planning needs is required.

This paper, taking this situational need proposes a futuristic as well as realistic city planning approach, which will connect people and technology with DP. This futuristic DP format will be smart to assess the live changes in the city and

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respond with an enhanced ownership and access of community. For doing this it first gives an overview of evolution of CDP and its origin, and evolution. It discusses major emerging dimensions like people and technology in planning of smart cities and finally proposes an integrative framework showing interface with smart city concept and roles of all stakeholders including ULBs(see Ministry of Urban Development, 2014).

2. URBAN PLANNING AND DEVELOPMENT PLAN: EVOLUTION AND PAST EXPERIENCES

In India, constitutional mandate (73rd and 74th Constitution Amendment Act 1992) has laid down the foundations of district planning and urban and rural planning in a great way. In post-independence India, planning for urban areas took a steady but slow pace. Here it is grossly divided into five phases and its experiences are discussed.

2.1 Evolution and Stages of Development Plan

The history of town planning in modern days (post-independence) is fairly new and substantial development in planning approach and formats came in the last thirty years. The following five phases (Fig. 1) show the brief description of planning experience in the parameters like (i) governance, (ii) planning at local level, (iii) impact.

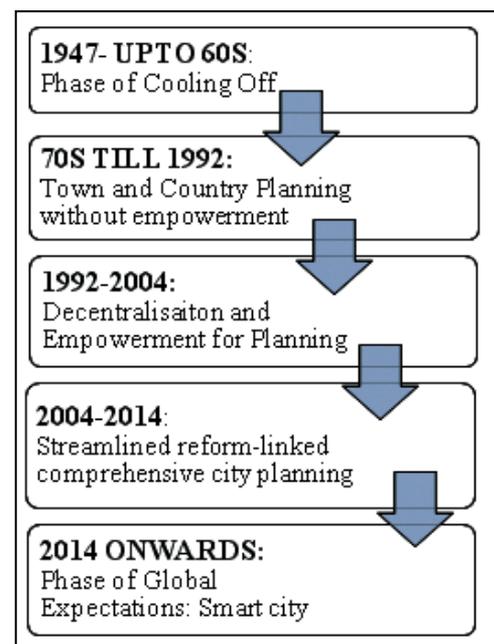
Phase - 1: From 1947 to 1970's: Post Independence Cooling off period

- All development works mostly based on the five year plan at the central level with minimum involvement of local governments;
- Less planning at regional and city level;
- Resultant emergence of slums, squatters and unhygienic conditions in the city; and
- Urgent need for planning interventions emerged.

Phase-II: From 1970's to 1992: Initiation of Town and Country Planning

- State level town and country planning acts framed as a response to the planning need;
- Metropolitan cities started comprehensive planning, no planning for other cities;
- Development authorities created;
- Piecemeal approach at local level in implementation; and
- Need for empowerment at the local level was felt.

Fig 1: Stages of Urban Planning in India





Phase - III: From 1992 to 2004: Decentralization of Local Governance and Planning

- Local government was recognized as the third tier of government;
- Decentralization and devolution of power with planning as a mandatory function of ULBs;
- Lack of capacity of ULBs to execute planning functions;
- UDPFI as a national guidelines for town planning formulated by the ITPI;
- Elected bodies at the ULBs level tasked with urban planning function; and
- Lack of civic service delivery resulting in the need for reforms linked with city planning.

Phase - IV: 2004-2014: Reform linked City Development Plans

- JnNURM (2004-2005) as the first City Development Planning program targeting compulsory planning and urban reforms interlinked;
- City Development Plan (CDP) done for the first time with central support;
- Stakeholders consultation included in CDP format;
- RAY (2009) envisaged slum free city planning (SFCP) and cities;
- Use of Remote Sensing and GIS in the RAY;
- Involvement of private players in the development; and
- Need for global competitiveness for urban development.

Phase-V: 2014 onwards: Smart Cities, Technology and beyond

- Prime Minister announced 100 smart cities for the first phase and 500 in the next phase;
- Excitement as well as confusions in conceptualizing smart cities;
- Use of technology in any form particularly in the 'pan-city development'; and
- Concern for the possible conflict, confluence and compatibility of people and technology.

2.2 Smart City and Development Plan interface

Government of India has taken policy to develop 100 smart cities and develop another 500 cities as the future smart cities. This concept of smart city has been envisaged on four pillars (Ministry of Urban Development, 2014). These are (a) social infrastructure, (b) physical infrastructure, (c) institutional infrastructure and (d) economic infrastructure. Based on these four pillars, Government of India has indicated benchmarks for each category of services and infrastructures, which influence the quality of life substantially. Most of the services are assumed to have deliverable online with higher degree of accountability in terms of time and quality.



Without going into detailed discussion related to conceptual framework of the smart city, the present paper considers some of the important dimensions of smart cities as mentioned earlier by some scholars. Nam and Pardo (2011a) identified several indicators and some of them are most relevant to India like (a) smart city is not only a technological concept but also a socio-economic concept, (b) smart city is not system driven but service oriented, (c) smart city is not a replacement of physical structures but harmony between material and virtual world (Nam and Pardo, 2011b).

In light of the above Roy *et al* identified three major missing links for conceptualizing smart cities in India. Those are termed as enabling factors for the ‘preparedness’ and identified as (a) cultural heritage and city ethos, (b) control on land and natural resources, and (c) organizational preparedness.

3. EMERGING DIMENSIONS: INCLUSIVENESS AND TECHNOLOGY

3.1 Inclusiveness

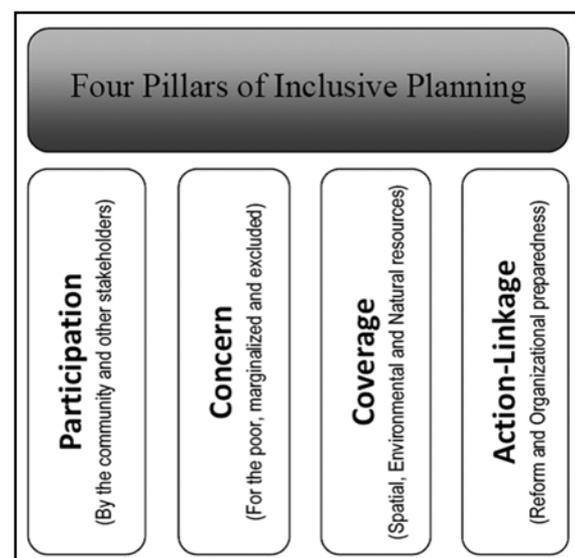
Inclusiveness is not a new term in planning and development. Roy and Biltoria (2014) identified four essential dimensions, which refer primarily to the inclusiveness orientation in social, economic, physical and organizational. Thus the four dimensions have been termed as four pillars of inclusive planning (Fig 2). These are participation by the community and other stakeholders, concern for the poor, marginalized and excluded, coverage for spatial, environmental and natural resources, and action-linkage required for plan implementation like reform and organizational preparedness.

3.1.1 Participation

Idea of community participation in planning can be traced back in 1950s and 1960s. Many government programs designed in the concept of self help in 1960s advocating the poor and oppressed should be part of planning and development process. In 1965 Paul Davidoff, a planner and lawyer, challenged planners to promote participatory democracy and positive social challenge and a plural planning involving people and interest group were proposed in the place of a unitary plan (Davidoff, 1965).

Deshler and Sock (1985) identified two levels of participation. Pseudo participation was characterized as domestication and assistencialism, which is nothing but informing,

Fig 2: Four dimensions of Inclusiveness (Roy & Biltoria, 2014)





manipulation, placation and consultation respectively. Whereas genuine participation was categorized as cooperatives (partnership and delegation of power and citizens control, which means empowerment.

Recent planning thinking has laid the foundations for a general sense of best practice, which is for an open and participatory process. But practitioners are aware of the large barriers in making this really work (Glasson and Marshall, 2007). Referring from a tracer study of participatory district planning Cooksay and Kikula suggest that participatory planning at the community level has the potential of providing the basis of district planning. Participatory Rural Appraisal (PRA) is expensive and time consuming but provides a higher chance of sustainability due to the ownership of the program (Cooksey and Kikula, 2005).

In India, stakeholder’s participation has been improved from awareness to participation and decision making. In some pockets the implementation or the actual development work has been a participatory process. Roy and Ganguly (2009) proposed a model for appropriation of top down and bottom up approach and it is given below:

Coverage and Concern: Eleventh Five Year Plan proposes the following parameters for considering concerns for inclusiveness:

Table 1: Planning Parameters and Role of Participatory (Bottom Up) and Master Plan (Top Down) Approach (Roy & Ganguly, 2009)

Sl. No.	Out come parameters	Participatory Approach	Master Plan Approach	
1	Study of Existing Situation	✓	✓	
2	Analysis of growth trend	partially	✓	
3	Availability of land	x	✓	
4	Important issues identified	partially	✓	
5	Recommendation of land assembly policies	Land Banking	x	✓
		Land Acquisition	partially	✓
		Town Planning Schemes	✓	✓
		Land Pooling	✓	x
		Accommodation Reservation	x	✓
6	Allocation of funds for development of land	✓	x	
7	Capacity of urban bodies to take up new thrust areas	partially	x	
8	Future land use plan and proposal	partially	✓	
9	Development Control	X	✓	
10	Prioritization of projects as per peoples need	✓	partially	

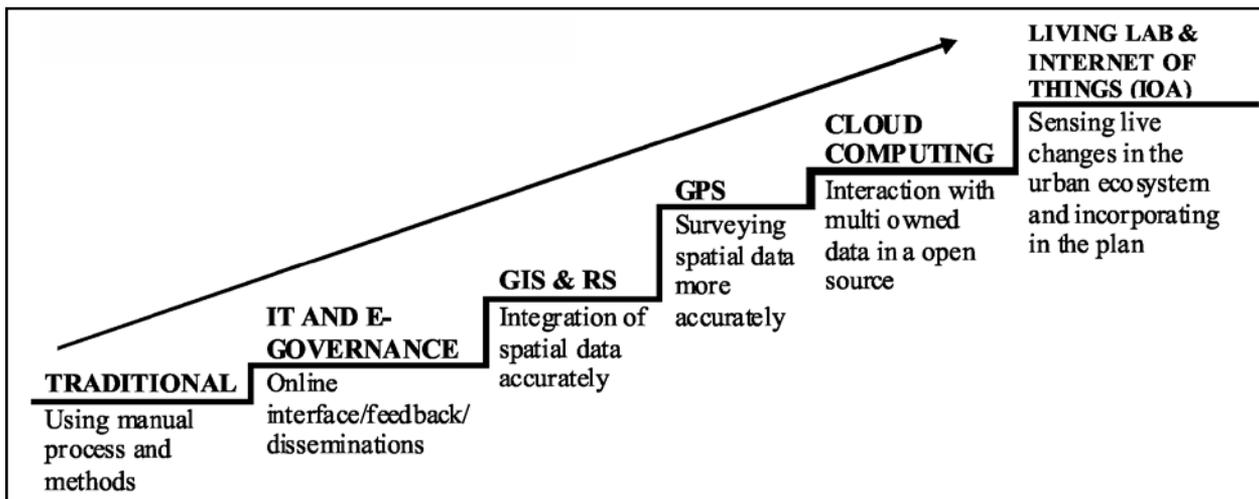


- Inclusive governance: entire system must function in a manner which is seen to be fair and inclusive;
- Inclusive sustainable development: Development is a qualitative indicator rather than quantitative. Development of human settlements shall not be unidirectional causing environmental degradation in the process. To direct growth on sustainable manner environmental impact assessment should be essential part of development plans and projects;
- Inclusive access to healthcare and education;
- For inclusive employment and regionally balanced growth, M and SME should be promoted;
- Developing capacities of infrastructure plays an important role in growth and development of cities. It also promotes inclusivity in the society by means of easy access to services;
- Agriculture has been identified as very important for promoting inclusivity. Various central acts, policies and guidelines make provisions that agriculturally fertile and multi cropped land be acquired only as the last resort. Same provision can be followed while planning human settlements;
- For inclusive development of society special attention to disadvantaged groups should be paid; and
- Disabled and oldage friendly infrastructure is integral factor for this.

3.1.2 Action Linkages

Linking actions emanated from planning is never given a serious thought. However, including inherent systems and solutions in favor of the feasibility of the projects so that the projects get realized is essential. That is why action linkage is another very important dimension in inclusiveness. Here in this paper the framework

Fig 3: Emergence of Technology in Planning





proposed includes the project planning, execution, monitoring and quality control. Due to the absence of inherent action linkage with the planning exercise, planning in India traditionally seen as 'one time exercise' and 'consultant driven' activities. Therefore, even after the thirty years of 74th CAA the competence of ULBS in terms of making plan document does not exist. Therefore, it is highly recommended to see planning as a holistic and continuous activity.

3.2 Technology

Use of technology for preparing DP has emerged from the limitation of traditional tools and techniques. We present the categories of technology for making DP more functional into five categories (Fig 3).

3.2.1 ICT and E-Governance

Globally cities are extensively using information and communication technology (ICT) to promote good governance, bring transparency in decision making and involve communities and residents in planning and decision making (Gupta, 2015). It can offer intelligent systems for saving energy cost, optimizing traffic lights and reduce air pollution and cost of tackling it, enabling government, business, organizations and residents to access geo-spatial data, using digital applications to register complaints and grievances, posting information online about pending changes to land use plan, sharing data suggesting best bus route. Moreover it can engage citizens as active partners in planning and development process (Gupta, 2015). IT in combination for planners can provide systematic collection, updating, processing, and distribution of land related data and information about zoning properties, roads, schools and parks, all pertain to geographic location. The use of ICT is now well established in governmental services in India with a legitimate capacity to handle it.

3.2.2 GIS and RS

GIS and RS brought revolution in studying, and analyzing the geo-spatial data in order to make future thematic plans. GIS in planning is concerned with the location based physical infrastructure viz. drainage sewerage water supply, pipeline, tanks, road network at different hierarchy, as well as social infrastructure viz. location of school, bank, cinema hall, post office, hospitals. The most important benefit of GIS is its ability to spatially interrelate multiple type of information stemming from a range of sources and has the scope for integrating information on the trend of development on a spatial base from various sources through the network system. GIS is one of the powerful tools being used for a wide range of applications such as smart transportation planning, smart site suitability analysis, smart development planning, preparing work orders to repair roads and smart services to provide comparative analysis of alternative development plans. Some of the applications of GIS are listed below:



- Land use planning;
- Integrated development planning based on natural resources;
- Land ownership database required for tax and revenue planning, and demographic analysis;
- Utilities mapping and management of electricity, water, telecommunications, roads, drainage, sewers, etc.;
- Environmental impact assessment, planning for environmental sensitive zones; and
- Watershed management.

In India, GIS is also well established as a subject and areas of attention. It was made compulsory tool in preparing SFCP during RAY. However, it needs further active support to integrate it with DP preparation process.

3.2.3 GPS

It is no exaggeration to say that GPS has revolutionized the field of surveying and mapping. Its applications are wide ranging. GPS is used in surveying and geodesy, transportation and communication, marine applications, aerial photography, navigation, space applications, mountaineering, military applications, etc. GPS has emerged as revolutionary tool in land surveying and navigation. There are several advantages compared to the traditional system. There is no need for inter-visibility between points on the ground and GPS can operate day and night with accuracy levels. GPS has a wide range of application. GPS is being utilized in many ongoing green fields as well as brown fields development to locate large scale infrastructure like roads, WTP, STP, etc.

3.2.4 Cloud Computing

Cloud computing is defined as a type of computing that relies on sharing computing resources rather than having local servers or personal devices to handle applications (Webopedia). It can integrate data provided by different departments and sections at a time to produce DP. The cloud concepts also provided planning agencies and departments the required independence from data legalization issues. The dependencies currently are authorized and signed data required for planning processes and decisions. When each of the responsible agencies and departments are advised to prepare and manage the data which is owned under the scope of their stewardship, the sharing of the data becomes a structured approach to other needing agencies and departments, thus defining the distinct landscape of owner and user with reference to the data being managed or used under a standard interface mechanism. This relationship driven integration on the cloud becomes flexible for either reduction or addition of some agencies and departments merely by disabling the interface. The security of the shared data could easily be configured



based on the structure of the data being shared. The cloud virtualization of process models would help largely in preparing the application segmented virtual data clusters that have unique process identity based on department wise aggregations (Reddy and Lakshman, 2015). Distributed computational infrastructure and data responsibilities

- Standardizations of interfaces;
- Regularizing the data collection and availability mechanism; and
- Upgradeability to application, scope and data requirements.

The cloud computing can offer wide range of flexibility in situation assessment phase, project monitoring and revision phases. People can see their projects they prioritized and provide feedback to many stakeholders at a time.

3.2.5 Living Lab and Open Innovation using Internet of Things (IOT)

Recent innovations such as open innovation and open business models and Living Labs, a concept originating from the work of William Mitchell at MIT (Ericsson, 2005) and currently considered as user-driven open innovation ecosystems, promote a more proactive and co-creative role of users in the research and innovation process. Within the territorial context of cities, rural areas and regions, the main goal of Living Labs is to involve communities of users at an early stage of the innovation process. The confrontation of technology push and application pull in a Living Lab enables the emergence of breakthrough ideas, concepts and scenarios leading to adoptable innovative solutions.

Future Internet research constitutes monitoring and governance platforms for increasing self-awareness of the changes brought about by the adoption of future Internet technologies. Peripheries have identified five archetypal urban settings: (a) the Smart Neighborhood where media-based social interaction occurs; (b) the Smart Street where new mobility behaviors develop; (c) the Smart Square where participatory civic decisions are taken; (d) the Smart Museum and Park where natural and cultural heritage feed learning; and (e) the Smart City Hall where mobile e-government services are delivered. Internet of things is a futuristic concept and has potential to predict very unusual changes in the environment, which is otherwise not feasible without detailed studies and surveys. However, it will take some more time to actually make the ULBs and local stakeholders competent to internalize and institutionalize this concept in India.

4. APPROACHING CDP IN A SMART WAY

At this stage we try to frame a canvass where a DP process is well illustrated with the role of people, technology and ULBs. Before presenting this integrative framework some basic assumptions are made as follows:



Planning is a Continuous Action: Planning does not end with the preparation of DP. Rather after preparation of DP the responsibilities are increased manifold to implement it. During that time the actions like monitoring and quality control becomes crucial. People should be allowed to see the progress and quality of the works they selected and prioritized during the DP phase. It is possible using simple technology. Therefore here planning is considered in a comprehensive way including project planning, execution, revision of plan and also recall of plan, which is not practiced in India.

Coping with Diversity: The framework proposed is a theoretical one. It cannot be a one-size-fit-all for whole of India. The degree of refinement and variations for different contexts need to be dealt with before applying the framework. Such variations are not included here in this paper.

Role of ULBs: It is assumed here that ULBs are the most important stakeholders in preparing and implementing DP. It facilitates planning by planners, and mobilizes people to participate in the planning exercise. Unlike the recommendations involving consultants as per government's approach, in this paper the ULBs are assumed to have pivotal role in making DP and executing considering the institutional sustainability.

5. PROPOSED DP FRAMEWORK INTEGRATING TECHNOLOGY AND PEOPLE

Based on the assumptions, discussions and inferences made in the earlier sections of the paper, the following framework (Table 2) is proposed. The framework is termed as approaching DP as a 'Service to Maintain and Attain Peoples' Right using appropriate Technology' (SMART). Here four dimensions discussed in the previous section (Fig. 2) are referred to while integrating the people and technology in overall planning stages. There are several advantage of the proposed approach as shown below.

5.1 Access by People

Shift from hard copy of master plan and regulations to a digital or online plan with interactive people interface will in many ways be better accessible by people.

5.2 Transparency

The confusion, manipulations and discrepancies in existing plans are one of the major causes for current chaotic and unregulated development in any city. The online development plan will be interactive and informative at the ward level. Development permissions could be very easy for the people at large and transparent.



Table 2: Proposed DP Process

Sl no.	Planning Stages	Tools and Technology		Role of people		Dimensions of Inclusiveness (Refer. section 3.1)
		NOW	PROPOSED	NOW	PROPOSED	
1	Sensitization	Very limited	Public address and campaigns	Participation		
2	Situation study and problem identifications	<ul style="list-style-type: none"> Primary and secondary surveys Interviews 	<ul style="list-style-type: none"> Focused Group Discussions / Meetings at ward levels Primary surveys using GPS and secondary surveys with help of Cloud computing Questionnaire surveys Online feedback and suggestions GIS/RS mapping 	Limited	<ul style="list-style-type: none"> Participation Raising issues and problems Giving suggestions 	<ul style="list-style-type: none"> Participation Concern Coverage
3	Visioning		<ul style="list-style-type: none"> FGD 	<ul style="list-style-type: none"> No role, adhoc 	<ul style="list-style-type: none"> Active participation 	<ul style="list-style-type: none"> Participation
4	Analysing and developing options	<ul style="list-style-type: none"> Classical planning theory and techniques 	<ul style="list-style-type: none"> Classical planning theory and techniques Simulation and prototyping 	<ul style="list-style-type: none"> No/Limited role 	<ul style="list-style-type: none"> No/Limited role 	
5	Selecting options and recommendations	Manual	<ul style="list-style-type: none"> Online feedback and suggestions Meetings at Ward levels 	<ul style="list-style-type: none"> No/Limited role 	<ul style="list-style-type: none"> Participation Giving suggestions 	<ul style="list-style-type: none"> Participation Concern coverage
6	Project prioritisation					
7	Validation	<ul style="list-style-type: none"> Absent 	<ul style="list-style-type: none"> Seeking online comments 	<ul style="list-style-type: none"> No role 	<ul style="list-style-type: none"> Scrutiny 	<ul style="list-style-type: none"> Concern
8	Approval by Govt.	<ul style="list-style-type: none"> Manual 	<ul style="list-style-type: none"> Manual Cloud computing 	<ul style="list-style-type: none"> No role 	<ul style="list-style-type: none"> No role 	
9	Preparing DPR	<ul style="list-style-type: none"> Manual (time consuming) 	<ul style="list-style-type: none"> Interface between department by cloud computing 	<ul style="list-style-type: none"> No role 	<ul style="list-style-type: none"> No role 	
10	Getting project approval			<ul style="list-style-type: none"> No role 	<ul style="list-style-type: none"> No role 	
11	Mobilizing finance	<ul style="list-style-type: none"> Manual 	<ul style="list-style-type: none"> Online using IT 	<ul style="list-style-type: none"> No role 	<ul style="list-style-type: none"> No role 	
12	Tendering			<ul style="list-style-type: none"> No role 	<ul style="list-style-type: none"> No role 	
13	Selecting contractor	<ul style="list-style-type: none"> Manual 	<ul style="list-style-type: none"> Manual 	<ul style="list-style-type: none"> No role 	<ul style="list-style-type: none"> No role 	
14	Supervision and monitoring	<ul style="list-style-type: none"> Manual 	<ul style="list-style-type: none"> Combined manual and GPS and Cloud computing 	<ul style="list-style-type: none"> No role 	<ul style="list-style-type: none"> Monitoring and feedback 	<ul style="list-style-type: none"> Concern and Action linkage
15	Quality control	Manual certification		<ul style="list-style-type: none"> No role 		
16	Completion	Manual	<ul style="list-style-type: none"> Manual with help of IT 	<ul style="list-style-type: none"> No role 	<ul style="list-style-type: none"> No role 	
17	Revision of DP	Absent	<ul style="list-style-type: none"> Online using IT 	<ul style="list-style-type: none"> No role 	<ul style="list-style-type: none"> Participation Raising issues and problems Giving suggestions 	<ul style="list-style-type: none"> Concern and Action linkage
18	Recall of DP	Absent	<ul style="list-style-type: none"> Online using IT 	<ul style="list-style-type: none"> No role 		



5.3 Accountability

The advantages associated with this approach are revolutionary, most importantly it will track the projects, monitor their progress and check the quality to a large extent.

5.4 Sustainability

As a result of greater access, transparency and accountability, the people will be also able to take more informed decisions on projects. By advancing the use of technology like regularly updating aerial images from drones and GIS software based informative platform and approval system; it is possible to realize a smart development plan.

6. CONCLUSIONS

The proposed framework in this paper is a theoretical construct emanating from the approach delineated in earlier exercises, and documents. For doing this it integrates two major elements, people and technology. However, the resent issues, which may arise out of the proposed framework are:

No planning concept is realistic without developing inherent capacity of local government and people with administrative empowerment. In India, the essence of the 74th CAA was to facilitate planning and development control at the local level. The CAA empowered the ULBs as local government but without the capacity to plan and vision for the city. During JnNURM an assessment based capacity building framework with central support was done so that ULBs develop their strength on the strong foundation of 74th CAA. In addition several reforms (mandatory and optional) were envisaged for improvement of urban service delivery and overall improvement of life. In spite of efforts for making Indian cities smart starting from 74th CAA as mentioned above, the process has been very slow. For example, the concept of City Development Plan took more than a year to internalize for the ULBs during JnNURM, KUSP, APUSP, USAID-FIRED programs. The long nurtured outlook towards project and scheme based governance made it difficult for the councilors to understand the words like vision, plan, strategy, etc. Still there was some improvement needed in terms of understanding the basics of city functions at the local level. The spirit of overall planning, vision, land use, accounting reforms, e-governance, property tax reform, citizens charter have now been well placed in the activities of urban local bodies. Municipal councilors do talk about these tools. There should be a continuous and coherent process for renewing the plan format for sustainability.

Pluralism of planning exercises indifferent names and themes as applicable in the urban local bodies not only confuses the local government but also



violates the constitutional spirit. It is difficult to prepare many development plans like DDP, CDP, SFCP, SCDP, and DMP as and when required. Making all city plans by external consultants will only satisfy the requirements, of local border, of getting a specific fund but not improve the capacity. With the emergence of smart city plan, the greatest challenge the ULBs are going to face is to integrate the upcoming and inevitable interface with state of the art technology and its people. Problem in this regard is that there is sufficient literature on inclusiveness and involvement of people in planning. But those are not integrated with planning policies. The smart city planning requires robust capacity building of ULBs to implement it. It is a prerequisite, and not post-facto action.

The proponents of technology driven methodologies are dependant more on the state of the art technologies. However, depending on technology without knowing its possible hazards and demerits may invite adverse outcome. Internet, GIS, RS, cloud computing, etc.; are tools to achieve certain objectives. But ultimately it is the people, not the hardware and the software, who make IT work and work for the good of the people (Mahizhnan, 1999). Therefore, a very conscious and committed approach is required for careful selection of technology for the country. A smart community should be able to build on their strengths and hire from others for collaboration.

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Smart City Bhubaneswar: The Issues and Challenges

Mayarani Praharaj, Ph.D.

Abstract

In the context of the Smart Cities Mission, this paper highlights the challenges of urbanization in the city, which includes housing shortages and slums, problems in drainage and sanitation, traffic and transportation, solid waste management, etc. The this paper also analyzes how the smart city project can be used to promote and ascribe value to cultural heritage of the city? It includes a discussion on smart cities approach to preparing the smart city proposal and its implementation strategies to making the city sustainable and smart for the future, and focuses on the challenges of performance measurement taking the case study of the temple city of Bhubaneswar.

1. INTRODUCTION

Rapid urbanization is a global phenomenon. In 2008, for the first time in the human history, there were more urban dwellers than rural, and the trends show that this is not going to be reversed. The total population of India as per the 2011 Census was 1.21 billion of which 833.46 million, which is about 69 percent of the total, lives in rural areas while 377.1 million, which is 31 percent of the total population, lives in urban areas. Odisha with 41 million people is the eleventh most populous state of India. Over the last decade, Odisha has witnessed a 14.1 percent population rise while the urban population increased a rate of growth of 27.2 percent. This shift from a primarily rural to urban population is projected to continue for the next couple of decades. Such enormous and complex congregations of people inevitably tend to become unhealthy and bound to live in disordered places without adequate and timely planning interventions.

Smart city could be a possible solution to all these problems. The objective of India's Smart Cities Program 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". It is in this context of the Smart Cities Mission, this paper highlights the challenges of urbanization in the city, which includes housing shortages and slums, problems in drainage and sanitation, traffic and transportation, solid waste management, etc. The purpose of this paper is to analyze how the smart city project can be used to promote and ascribe value to cultural heritage of the city.

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The paper includes a discussion on smart cities, approach to preparing the smart city proposal and its implementation strategies to making the city sustainable and smart for the future. The paper also focuses on the challenges of performance measurement with the case study of the temple city of Bhubaneswar.

2. DEFINITION AND COMPONENT OF A SMART CITY

There are many definitions of smart cities. The Ministry of Urban Development provides benchmarks for various services - maximum commute time should be 30 minutes in medium-sized cities and 45 minutes in metros; water availability must be 135 liters per capita per day; 95 per cent of homes should have shops, parks, primary schools and recreational areas within 400 meters, and so on.

As per the report of Smart Cities - World Government Summit, a smart city is defined as a city that operates in an ambitious and innovative manner covering areas of economy, people, governance, mobility and environment. Such innovation is to be built on the smart combination of support and active participation of self-decisive, independent and aware citizens.

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.

Area-based development will transform existing areas (retrofit and redevelop) including slums, into better planned ones, thereby improving livability of the whole city. In retrofitting the existing structures are largely retained and number of smart application may be added to make it smart. In this method, generally an area more than 500 acres will be identified by the city in consultation with citizens. This may include implementing high ground coverage and mixed land use. New areas (greenfield) will be developed around cities in order to accommodate the expanding population in urban areas. Pan-city development envisages application of selected smart solutions to the existing city-wide infrastructure. Application of smart solutions will involve the use of technology, information and data to make infrastructure and services better. For example, applying smart solutions in the transport sector (intelligent traffic management system) and reducing average commute time or cost of citizens will have positive effects on productivity and quality of life of citizens. Another example can be waste water recycling and smart metering which can make a huge contribution to better water management in the city. Passengers' safety



will also be given attention. Technology enabled parking management will be introduced.

3. AN APPROACH TO SMART CITY BHUBANESWAR

The city of Bhubaneswar was planned in 1948 and the master plan of the city was prepared by a German architect and planner Dr. Otto H. Königsberger. (Fig. 1) The city is now in tentative list of UNESCO heritage city. Since the city has a presence of sites of heritage importance there are chances of increasing tourists' inflow and this may help to enhance better future development of the city. This component comes directly from the concept notes of Ministry of Urban Development for smart cities. Presence of heritage and tourism will get a score of 1 point in the criteria for the selection of smart city.

3.1 Urban Development Challenge in Bhubaneswar

Bhubaneswar is experiencing the problems associated with rapid urbanization including growth of slums, and deterioration of the physical environment. Now,

Fig. 1: Temple city, Bhubaneswar



Fig. 2: Visual dominance: Buildings very close to Sireswar Temple



Fig. 3: Temple city, Bhubaneswar



Fig. 4: City transformation





over 35 percent of population lives in slums. Increase in land values, cost of construction and lack of affordability for the poor are the major reasons for the development of slum pockets in the city. The effects of climate change have been observed since last few years in the city. It has been found to be excessive heat in summer both during day and night. The temperature in summer is around 40 degree Celsius most of the days, which not only affects the health and comfort of the people but also demands more energy. In Bhubaneswar, dwellings in and around Ekamara Kanan, Jayadev Vihar, Gajapati Nagar, Sainik School, Vani Vihar, west of Mancheshwar, Acharya Vihar, Iskcon Temple, Aiginia, Jagamara and Pokhariput are the areas through which the natural drains pass. But due to upcoming structures in these areas, the floodwater cannot drain properly and creates waterlogging.

Rapid urbanization has become a great concern for heritage conservation. (Fig. 3 and 4) There are many threats to cultural heritage sites. Due to development pressures, archaeological sites are neglected or surrounded by poorly planned commercial developments. The fine architectural elements are gradually losing their importance. In many areas, there are encroachments and narrow heritage routes. This creates problems for the visiting tourists.

3.2 Procedure for Selection of Smart City

Smart Cities have been distributed among all the states and union territories on the basis of their urban population and number of statutory towns. The formula gives equal weightage to urban population and statutory towns. Based on this formula, each state and UT has been given a certain number of potential smart cities. Odisha gets two cities, i.e. Bhubaneswar, capital of Odisha; and Rourkela under the Mission.

The smart city program has identified six basic criteria for shortlisting the smart cities. These are implementation of online e-governance, publication of e-news letter, transparency and putting all government spending in public domain, focus on hygiene and upgradation and increasing of the number of toilets and clean and unbroken salary payment records to government employees and introduction of citizen participation in urban governance.

A city's urban performance depends upon interplay of city planning and design, physical infrastructure, social infrastructure, organizational capacities, regulatory framework and other related elements. The philosophy of smart growth promotes walkable neighborhoods containing a range of housing and job options encompassing principles such as transit oriented development and non-motorized transportation plans.



For a city to be smart, all seven systems must become smart. Across these seven systems, the following principles will help each of the system to become smart.

Citizen's Engagement: The system has to be citizen centric and must engage citizens directly or through community based organizations.

Radically Transparent: Right to Information Act and Public Disclosure Guidelines must be followed. This will help in building confidence and trust of citizens, private sector and various organizations in functioning of city systems.

Democratically Accountable: The system must be democratically accountable at various levels such as Wards, City Municipal Corporations, and Regional (Metropolitan) levels.

Inclusiveness and Equitable: The system needs to be accessible to all and specific strategies needs to be developed for bringing economically weaker sections as an integral part of city, be it in Housing (Affordable Housing) or trade and commerce development (Street Vendors). Similarly, issues related to Women, Children, Persons with Disability (PwD) must also become part of city planning and development process.

Public Private Partnership (PPP): Private sector and Industry should take the lead in development of infrastructure, shelter and commercial spaces. This should be done on a transparent platform and under a well - defined policy frame work.

Financially Prudent: The city must have multiple options of financing investment in physical and social infrastructure. This will include development of various instruments which will leverage strength of cities on achieving full potential of growth.

Environmentally Sustainable and Resilient: The impact of development on environment needs to be reduced to minimum level so that the city will remain sustainable for the current and future generations.

3.3 Multi-dimensional Planning Approach

Of all the seven city systems that are described above, urban planning and design is the most critical. Continuing its strong foundation in implementing contemporary urban planning principles, Bhubaneswar is one of the few cities in the country to have adopted and implemented a multi-dimensional planning approach towards building smarter communities. These include:

Pan-City: 2030 Perspective Plan for Bhubaneswar Cuttack Urban Complex (2007), Preparation and notification of Comprehensive Development Plan (2010) and

Fig. 5: Existing Mobility



Formulation of TOD supportive Zonal Development Plans (Ongoing) Citywide Transit Oriented Development Policy (Ongoing).

Urban Extension and Greenfield: Identification and preparation of town planning schemes as an urban growth strategy through effective management of land resources; and master planning of mixed-use integrated townships in Jagamara and Shyamapur.

Urban Infill: Redevelopment Plans underway to promote compact, higher density, mixed-use living in the urban core of the city. Redevelopment of Master Canteen Chowk as Bhubaneswar's new Town Centre and Multimodal Hub

Housing: The city administration is currently preparing a 'Housing for All- Action Plan for Bhubaneswar city' which includes formulating a cohesive strategy for low cost housing, slum rehabilitation and redevelopment housing. In addition, BMC has successfully initiated projects to address the current demand for housing in the city for new migrants and slum dwellers.

Key Projects: BMC has earmarked 60 acres of government owned land to develop 10,000 EWS and LIG housing units in the city. Redevelopment of six (6) slums through PPP model providing 4,000 units. Under the Rajiv Awas Yojana (RAY), BMC has initiated projects to provide housing for over 3,500 households. Infrastructure Development Fund (CIDF) to provide for funding support for various activities required for provisioning of housing for all.



4. SELECTION PROCESS FOR SMART CITY-BHUBANESWAR

There are two stages in the selection process. Stage 1 of the competition: During short listing of cities Bhubaneswar obtained 75 score, and was short listed and qualified for stage 2 challenge. A detail of score obtained by Bhubaneswar as short listed city is given in Table-1:

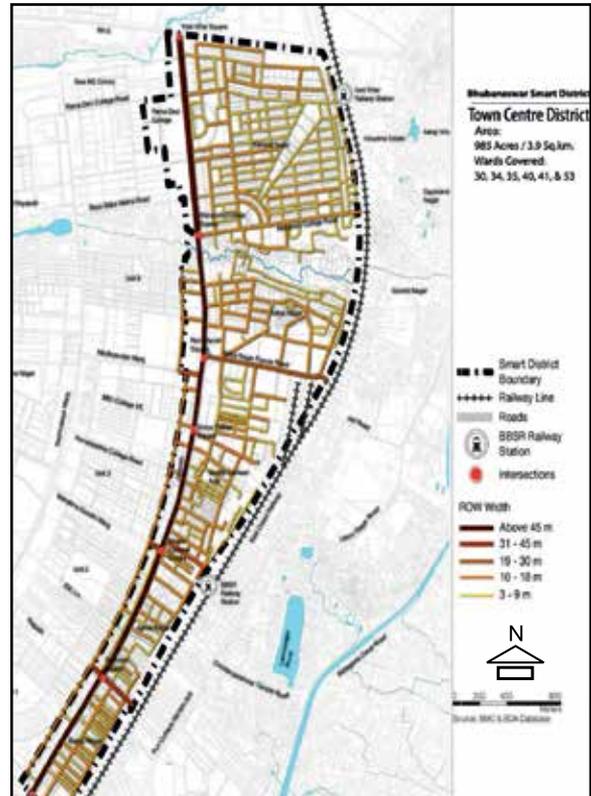
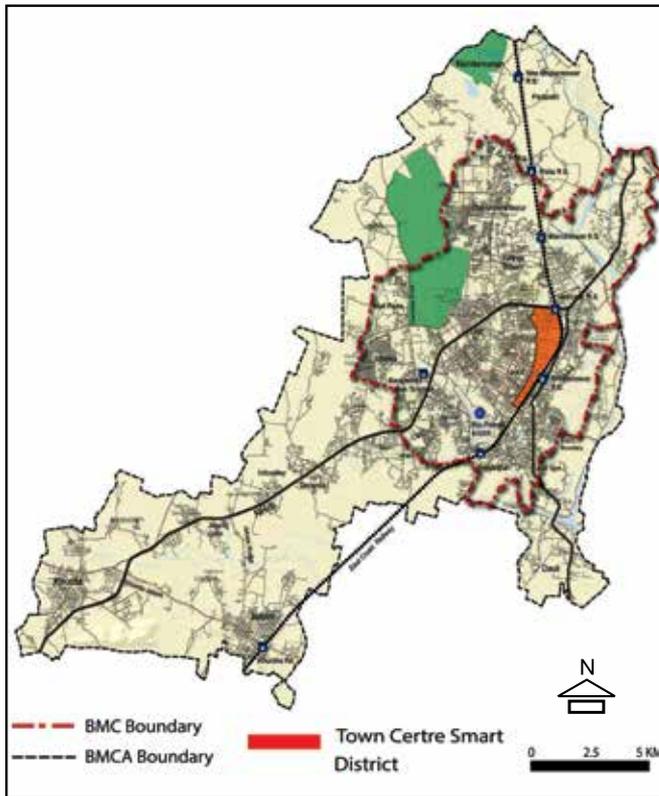
In the second stage of the competition, each of the potential 98 smart cities prepared their proposals for participation in the 'City Challenge. This is a crucial stage as each city's Smart City Proposal is expected to contain the model chosen, whether retrofitting or redevelopment or greenfield development or a

Table 1: Criteria and Score Obtained by Bhubaneswar

S. No	Criteria	Total Score	Score obtained
1	Increase over Census 2011 or Swachh Bharat baseline on number of household sanitary latrines (whichever is less)	10	10
2	Making operable Online Grievance Redressal System with response being sent back to complainant	5	5
3	At-least first monthly e-newsletter published	5	5
4	Electronically place project-wise municipal budget expenditure information for the last two financial years on the website	5	5
5	Levy of compensatory penalty for delays in service delivery	5	5
6	Collection of internally generated revenue (e.g. taxes, fees, charges) during the last three FYs (2012-15)	10	10
7	Payment of salaries by ULB up-to last month	5	5
8	Audit of accounts for FY 2012-13	5	5
9	Percentage contribution of tax revenue, fees and user charges, rents and other internal revenue sources	10	10
10	Percentage of establishment and maintenance cost of water supply	10	5
11	Percentage contribution of internal revenue sources (self-generated) used for capital works during FY 2014-15	10	10
12	Percentage of City-level JnNURM Reforms achieved	10	0
13	Percentage of completion of Projects sanctioned upto March, 2012 under JnNURM	10	0

Fig. 6: Location of Bhubaneswar Town Centre District (BTCDD)

Fig. 7: Road Net work of Bhubaneswar Town Centre



mix of these approaches, and additionally include a Pan-City dimension with smart solutions. Evaluation criteria for the second stage of competition accords a weightage of 30 for city level evaluation criteria and 70 for proposal level evaluation criteria.

The state government and Bhubaneswar Municipal Corporation (BMC) unveiled a series of public campaigns over the last one year to bring in people to participate in the smart city campaigns so that their feedback could form the basis of its plan. The online and offline polls conducted by the BMC had at least three lakh people voting strongly in favor of an improved urban transport and mobility systems. Close to two lakh participants wanted reforms in drinking water supply, waste and energy management systems of the city. Many others demanded for more open spaces and plans for heritage hubs of Bhubaneswar.

The plans on development are as follows:

- Pedestrian-friendly traffic signals will be introduced.



- Open spaces and parks to be developed to make the city ecologically sustainable.
- The city administration will also install at least five surveillance cameras at 26 major traffic junctions to check crime.
- An online parking ticket system will also be introduced at three multi-level parking lots here.

In the winning city proposal Bhubaneswar got the score of 78.83 points and topped the list.

The major component of the proposal is construction of the Bhubaneswar Town Centre District (BTCD), a 985 acre project which will be developed as a model area with better urban mobility and waste management system. The key areas that come under the proposal is Janpath Road (East), Udyan Marg

(South), Railway Tracks (West), and Maharishi College Road (North). The areas include 2.4 percent of BMC and 0.3 percent of BDPA. There are seven wards coming under BTCD. These are ward numbers 29, 30, 34,35,40,41, 53 and 46,000 people lived here in 2015. Total road network is 70.5 km, which includes 5 km road of 60 m wide (7 percent), 6.5 km of 45 m-18 m wide (9.3 percent) and 59 km of less than 18 m wide (83.6 percent). There will be cycle tracks along the town centre and will also open cycle rental centers in the area.

Fig. 8: Transit Priority Network Smart District Boundary



Development of facilities such as drinking water and sewerage has already been taken up under the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) scheme. Besides planning to roll out a fleet of 565 buses to connect all the 67 wards of the city and the administration is also promoting non-motorized mode of transport.

The corporation has already started organizing events such as Raahgiri to promote no-car days. The event has a positive impact on several aspects like non-motorized transport usage, road safety, greater engagement among people and increased physical activity.

4.1 Bhubaneswar Town Centre District

The key city landmarks in the district include Ashoka Market, Master Canteen Chowk, Bhubaneswar Railway Station, City Bus Terminal, Ram Mandir, Rajmahal Chowk and its immediate surroundings. Janpath, the city's primary thoroughfare is to be remodeled into a "people's smart path" that will have a larger green cover and designated vending zones. The plan is to promote BTCD as a self-contained central business hub with transit, pedestrian oriented development, bringing together people, jobs, and services connected with each other primarily by walking, cycle or public transport.

Fig. 9: Raahgiri in Bhubaneswar



Fig. 10: Present Master Canteen Chowk as Bhubaneswar

Fig. 11: Future smart city: Redevelopment of Master Canteen Chowk as Bhubaneswar's new Town Centre and Multi-modal Hub





Fig. 12: Land use of Bhubaneswar Town Centre District (BTCD)

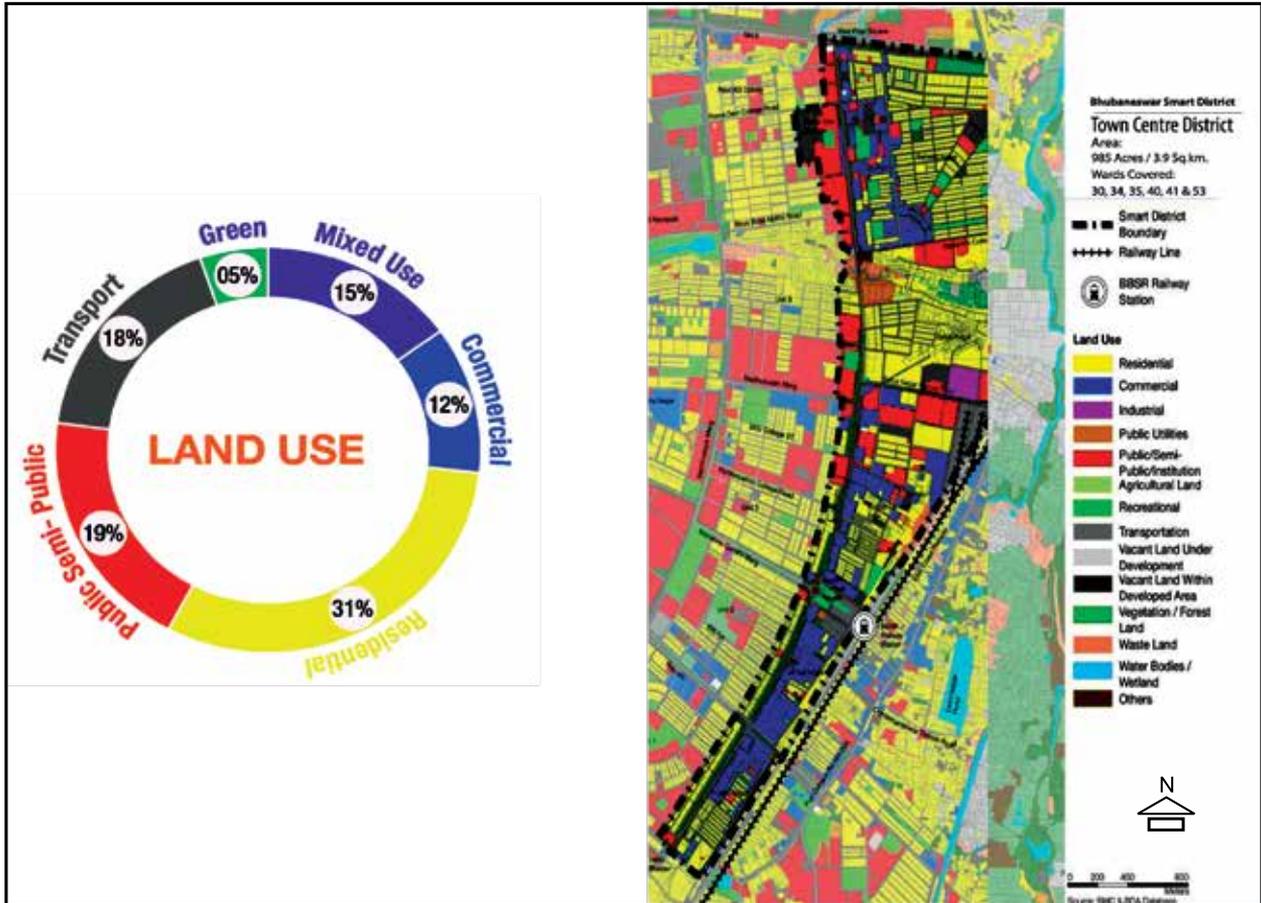
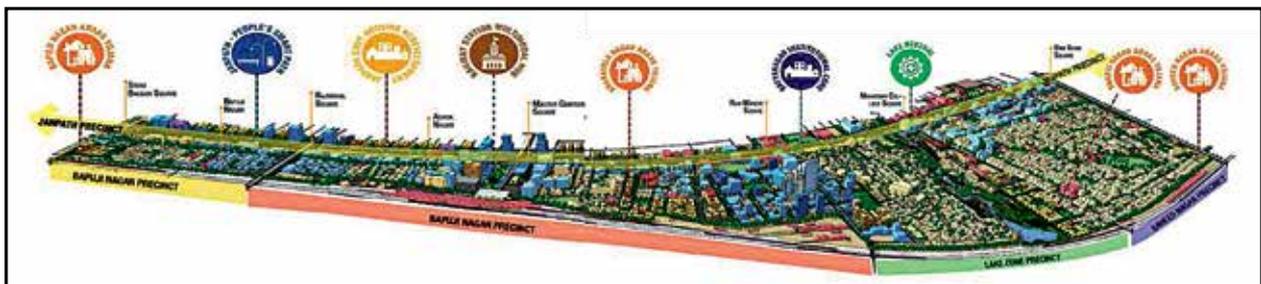


Fig. 13: Proposal for Bhubaneswar Town Centre District (BTCD) Source -cidco-nl.pdf



The proposal includes Multi-modal Transportation Hub at Railway Station, Master Canteen Chowk Reconfiguration, Lake Zone Entertainment and Recreation Area, Mixed-Income Affordable Housing projects, Mixed-Use Transit Oriented Development (TOD) projects and Janpath "Smart Corridor" Bhubaneswar's pan-city proposal includes state-of-the-art Intelligent City Operations and Management Centre (ICOMC) is at the core. This centre will provide digital platform for



integrating multiple city sub-systems of traffic management, parking, bus and para-transit operations. Besides, the plan emphasizes on improving infrastructure such as better roads, installation of solar and LED lights, round the clock water supply, waste management, Wi-Fi zone, special bicycle track from Nandankanan till Lingaraj temple etc.

5. MEASURING A SMART CITY: SMART CITY MEASUREMENT TECHNIQUES

Performance analysis is an important tool in plan or project assessment and assessment of cities. The goal is to combine city level operation with cooperation between local different systems in order to monitor performance. There are two major types of indicators: the first portrays the profile of the city by measuring its basic characteristics, and the second set measures its performance. Each one of these indicators is a composite one and it is a matrix that is calculated from variables. For example, people are an indicator and it is composed of 10 variables. Among these are total population, percentage of population that are children, percentage of population that are youth and so on. Once these ten values are known, then a matrix is defined to combine them and come up with a value for the people indicator. Other indicators include housing, economy, government, geography and climate.

The other type is the set of city performance indicators, and normally it is structured around 20 themes. They measure a range of city services and quality of life factors. City services indicators include education, energy, finance, recreation, fire emergency, response, governance, health, safety, solid waste, transportation, urban planning, waste water and water. As for quality of life, its indicators are civic engagement, culture, economy, environment, shelter, social equity, technology and innovation. Again, each indicator is made up of a matrix of several variables.

This research on measuring a smart city examined many kinds of measurement models, indicator sets, and methods of assessment of smart cities. It is realized that some of them focus on different levels of smart city aspects and components, hence not only different things to measure, but in different levels and views. There are mainly two levels for which measurement of smart cities can relate.

Macro level governance view is the level at which cities are measured for smartness in a more general level. In fact the most relevant measurements at this level are concerned with overall qualities of the smart city and its operation. Three main ones are identified clearly:



- Performance Measurement;
- Characteristics measurement; and
- Maturity measurement of the Smart City.

In the Special Interest View, smart cities have to be also evaluated in terms of its capability to react and integrate within certain aspects such as geographic, national commitments, e-government related linkages, and open data development. Regional development is important for development of the whole region i.e. how much a smart city is interacting with other cities in the region, or how much a smart city contributes to a smart region. Successes and challenges measuring the smart city is a process that is liable to yield successes but also it faces challenges. The selection of the proper matrix and measurement method would develop good results that can direct decision makers for the best decisions to be adopted by the smart city government. Smart buildings come in an almost limitless variety of ages, structures and functions, with the capabilities of building systems being similarly diverse. Smart building is defined as that that uses technology to improve the efficiency, comfort, security and safety of a building in a cost-effective way and most of these factors can, to some degree be measured. But to measure a smart city one need to know about the key attributes of a smart city, score a city against these and weight the various attributes like the economy, mobility, environment, people and governance.

After the selection of the cities in Stage - II of the City Challenge, the process of implementation will start with the setting up of the Special Purpose Vehicle or SPV created for the purpose. The SPV will plan, appraise, approve, release funds, implement, manage, operate, monitor and evaluate the smart city development projects. An SPV would be constituted and sufficiently empowered by the state and local government to do all development related work within the selected area (s) of the city under the Smart Cities Mission.

Scoring 78.83 marks out of 100, the capital city of Odisha not only projected itself to the top position but also set huge challenges to meet over next five years during which it will have to come up with smart solutions for improving urban mobility, waste and water. The Smart Cities Mission puts a significant emphasis on stakeholder consultations, particularly involving citizens. The Smart City Proposal (SCP) mandates citizen engagement in three rounds - visioning the smart city, identifying area based development and pan-city solutions and during implementation of the area based development proposal and pan city solution. The process of making a city smart should be people centric. Besides,



it would require smart thinking to improve the access to water, sanitation and other dwelling characteristics.

Bhubaneswar is a religious and tourism dependent city in Odisha. To make the city smart by retaining the existing fabric of the city is a challenge. More thought is required to make the city sustainable, livable and smart. Smart growth increases property values and makes it difficult for the poor to live near areas that are growing economically. Therefore, there is a need to introduce smart solutions in the vacant areas of the city. This should include innovative planning techniques for provision of affordable housing for the poor to meet the needs of the growing population.

For transforming existing city to smart city or a development of new smart city, a very strategic development with maximum use of advance and high technology is prerequisite for any developing country. Strategically old city can be converted into a smart city. Similarly government can also develop entirely new smart city. Off course it is difficult to convert old city to smart city as compared to development of new smart city. For old city, transformation management process is required to be evolved and need to be given more emphasis. On the other hand for new smart city development all the existing development laws have to be reviewed and a latest urban development law is required to be framed.

Bhubaneswar's cultural heritage is a fundamental aspect of the city's identity and must be transferred to the next generations in the best possible condition. The new trend in creating Smart City - Bhubaneswar should reflect this cultural heritage. All historical buildings and temples in old Bhubaneswar need to be protected and conserved. One major challenge is the restoration of water bodies. The central area of Bhubaneswar designed by Königsberger is a special urban heritage site of the city with outstanding planning features and has a public value. The buildings designed in this area by an architect Julious Vaz are the important landmarks of the city. These buildings with special architectural interest along with the site should be protected from alterations by regulatory techniques.

6. CONCLUSIONS

Smart city is another framing of cities. In Bhubaneswar it is an approach to urban transformation through spatial approaches like retrofitting the existing city plan and redevelopment, pan-city initiatives and greenfield development.



As the greenfield development may be applied in the peri-urban areas of the city, it is necessary to apply green urban planning techniques for green fields located in peri-urban areas of the city. Besides BTCD approach may be applicable to different other zones of the city lacking proper amenities and infrastructure facilities. Bhubaneswar as a heritage city attracts a number of people due to the heritage and religious value. Therefore, it is necessary to give importance to its heritage components.

The success of the smart city project depends upon proper implementation of smart technologies through the city planning process. This exercise of designing smart cities is an opportunity for all the professionals as city planners, urban designers and landscape architects. Besides, to fulfil this goal, there is a requirement of involvement of citizens in decision making processes. Efforts should be made for conservation of heritage, amazing temples and monuments. Smart city planning must be timely prepared and effectively implemented in the public interest. People centric technological applications will fulfill the aspirations of every individual to fulfill the dream of the Smart City Bhubaneswar in future. There are many kinds of measurement models, indicator sets and methods of assessment of smart city. Constant research is going on to measure the potential of cities through establishing specific methodologies and indicators. There is a need to develop a framework for properly measuring the smart level of the city and its performance for better implementation of the smart technology in city planning.

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The main point in building a city should be to keep the social aspect always in view. This is usually completely forgotten and people think in [terms of] putting up a number of imposing official buildings. Another point to be borne in mind is that as far as possible the material to be used for construction should be locally available.

Jawaharlal Nehru



The Vulnerability of Smart City Mission



Sugandha

Abstract

Smart cities are mushrooming all over the world, started with technology advancements gradually focusing with a digital base. But Smart cities are not just about data and technology. Therefore, it is important to understand what further ingredients are required to design a sustainable environment. A citizens' viewpoint on the subject has been explored along with various components of smart city architecture to understand the different mechanisms involved in the context of energy cost and capacity building. Creative professionals shall play a very important role in actualizing these mechanisms of smart cities on ground with sensitivity towards human interface. It is not just about a city being responsive and reactive instantaneously, but is about a city becoming predictive and evolutionary.

1. INTRODUCTION

It is heartening to note that India's economy has become the world's fastest growing major economy, replacing the People's Republic of China. The Indian economy has the potential to become the world's third largest economy by the next decade, and one of the largest economies by mid-century. The outlook for short term growth is also encouraging. According to IMF, the Indian economy is the "bright spot" in the global landscape (IMF, 2015). India also topped the World Bank's growth outlook for 2015-16 for the first time with the economy having grown 7.3 percent in 2014-15 and expected to grow 7.5 to 8.3 percent in 2015-16. We can safely assume that India is getting smarter in terms of economic growth.

At present, there is plethora of ideas in making cities sustainable, but very few to make them smart. A city that is smart is definitely not an inch closer to any city we have in India. The very crowning of the word 'smart', leaves us pondering that do we really know what a smart city is or it is a new chimera that we are driven into. There are plethora of ideas and desires contained in the most complex sense.

This paper explores the definition of a smart city as explained by Government of India. It further reconnoiters the understanding of various humanizing aspects that formulate a smart city from the point of view of a citizen and its components that help successfully establish the concept. Role of creative professionals in the Smart Cities Mission and the way they can make a positive impact towards realizing this dream project of India.

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2. DEFINING SMART CITIES

As described in the draft URDPFI Guidelines 2014, Ministry of Urban Development, Government of India, a smart city uses information, communication and technology to enhance its livability, workability and sustainability. It is build-up of three basic functions: information collection, communicating and analysis.

Most of the urbanists are of the view that understanding of smart city initiatives need to be about more than creating apps, city information portals or leakage investigating systems. Smart cities are not just about data and technology. In fact the smartest cities are the ones that are beginning to focus on how they sustain themselves for the future. It is about considering how cities will cope and compete in terms of being attractive places to live in and are affordable for city authorities and citizens at the same time.

3. HUMANIZATION OF SMART CITIES - A CITIZENS' VIEW

For an Indian citizen, a city that can provide all the basic level of amenities and comforts to the inhabitants is a smart city. It is not just about smart elements but about smart lifestyles. With the human aspect attached, an experience of a smart city is a day night lifelong process. Our elementary need is portable water from a tap round the clock. The hassle of individual water filters should be omitted from the system. One should be comfortable with a water source and consume pure water.

The milk, bread and vegetables we buy, cover a long distance. City greens should not be limited to being urban forests or urban parks. They should facilitate food management through urban farming, providing fresh commodities in the heart of the city with no additional supply chain costs and at the same time reducing carbon footprints. A policy to cultivate farms as an ancillary industry to organizations can be explored.

There should be freedom to walk and cycle safely in pollution free surroundings. Leaving the kids on their own to walk to school or to school bus should not be a nightmare. Walkable urbanism should be a reality and not a paper concept. Uniformity of job opportunities and recreational facilities across the city with emphasis on proximity can address this issue.

Mostly work spaces are technically planned lacking break-spaces. Humanizing work spaces where green and open spaces are designed can do wonders to improve employee output. An enjoyable environment from office to public transport nodes with dedicated lanes for walking and cycling can help improve physical health.

Safety and security of an individual or community is of prime importance. In the absence of strict administration we are grooming a population that lack basic



civic sense and city system knowledge leading to breach of rules and regulations. Our social and cultural environment should be reinforced along with educational reforms to sow the seeds for making responsible smart citizens. We should build information and knowledge capacity within the buildings to improve design standards and provide special features for better living environments of aged and people with disabilities, and their careers. Urban planning and architecture can together combine technology and nature, making any city a better place to live.

4. COMPONENTS OF SMART CITY ARCHITECTURE

Components of a Smart City Architecture - is one way of describing the context for smart city systems and infrastructure. (Table - 1) It contains six layers: goals, people, ecosystem, soft infrastructures, city systems, and hard infrastructures.

Goals, People, and Ecosystem - Every smart city initiative is based on a set of goals. Often they focus on sustainability, inclusivity and creation of social and economic growth. Communities are living, and breathing manifestations of city life, of course, not structures to be engineered. They are vital elements of the city's ecosystem: they provide support; they are expressions of social life; they represent shared interests and capabilities; and they can play a role in communicating between city institutions and individual citizens.

Soft Infrastructure - They include organizations and interest groups which support city communities.

City Systems - These systems provide life support for cities - they feed, transport, education and healthcare for citizens; and also support communities and businesses.

Table: 1 Component of Smart City Architecture

Goals	Wealth, Health, Opportunity, Safety, Independence, Choice, Sustainability			
People	Citizens, Employees, Innovators, Visitors, Differently Abled			
Ecosystem	Private Sector Retailers, Employees, SME's	Public Sector Emergency Services, ULB's	Social Enterprises NGO's Charities	Community Neighbourhood, Cultural and Religious, Family / Social
Soft Infrastructure	Leadership and Governance, Innovation Forum, Networks and Communication Organization, Planning, Investment Envelope			
City System	Transport, Health, Culture, Economy, Governance, Utilities, Social Care, Public Safety, Education, Food Management			
Hard Infrastructure	ICT, Transport and Utilities Network, Spaces, Buildings			



Hard Infrastructure - These technology capabilities operate within a physical context of a city: its buildings, spaces and networks that support transport and utilities.

5. WAY FORWARD - ROLE OF CREATIVE PROFESSIONALS

The challenge for planners, designers and administrators of smart cities is to create infrastructure and services that can become part of the fabric and life of this ecosystem i.e. to absorb all the components of smart city architecture more efficiently. To do so effectively is to engage in a process of co-creative dialogue amongst system architects, urban planners, building architects, citizen forums and government organizations.

Urban planners must design the city systems and hard infrastructure to achieve the city goals in relation to its people, ecosystem and soft infrastructure. Architects need to do building designs that encourage creation of more environmentally aware citizens. System architects can help design functions better - with better security, better real time monitoring, better information, and better connectedness with government and healthcare. The challenge is to have city systems, built environment and building systems react and respond to peoples shifting needs. City infrastructure and architecture should be designed with flexibility that meets certain structural and safety standards to withstand worst case weather and seismic challenges.

Successful development of a smart city will require the combining of a bottom up systems approach with a top down service development and data centric approach. Technology integration includes vertical integration from sensors to low cost communication, real time analysis and control, and horizontal integration of isolated systems up to citizen based services. When combined together this creates system of systems. Today we are mainly focusing on improving the integration of vertical i.e. parts of existing utilities, e.g. improving energy efficiency, or reducing water leakage. The next step is horizontal integration. The data from different sectors can be combined to better manage the city and reduce risks. Horizontal as well as vertical integration is the key to creating value and interoperability.

A bundle that each city offers is very different. For example, London and New York compete aggressively to be top of the pile in terms of the leading cities for financial trading. Both offer rich, cosmopolitan environments to live. But both are becoming less affordable places to live even for city traders. The property is expensive and transport systems are grinding to halt as they get more popular. There has to be a tipping point where people question whether London or New York are really good places to work and do business as they approach what feels like saturation point. Therefore, we need to think very carefully about how to free up more housing, how to add more capacity to transport networks and how



to plan for additional capacity. But we need to plan in the context of increasing energy costs and government austerity. Technology can help but only in the context of smart infrastructure investment.

Rather than drawing a vision to only build cities into smarter cities by twitching in their complex systems and try to make them smarter; a nexus between organic living and city living can provide necessary infrastructure to remote areas. By developing new sites around rural pockets can address issues like connectivity, industrialization and employment opportunities in distant parts of the country. This will also show positive impacts on the currently choking city systems reaching their tipping point. Smart just is not for the affordable but its impact should reap benefits for the country at large. The process of thinking about these things in concert has to start sooner rather than later.

6. CONCLUSIONS

Smart cities can only exist if fundamental reforms are undertaken in respect of all the components of smart city architecture and creative professionals. New approaches are necessary to design, implement and finance smart city solutions both in cities. A human interface and their sensitivity towards each aspect of smart city apart from the technology involved should be addressed as comprehensive package towards new league of development. This union shall take cities forward towards sustainability and can be termed as 'HU-Tech Smart City' which has essence of humanization and technology advancement of the city in the context of energy cost and capacity building.

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