Chapter 10
Smart and Livable Cities: Opportunities to Enhance Quality of Life and Realize Multiple Co-benefits

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Abstract Throughout human history, cities have been centres of prosperity, ideas and innovation. These days, smart cities are creating a new buzzword across the world. Examples boom in Japan, Europe, UAE and Singapore while several others are shaping up on the drawing board. With the recent announcement of 100 new Smart Cities, the Government of India has strategically responded to both the international call for innovation and transformative sustainability as well as growing domestic pressure in cities. Interestingly, there is neither an internationally accepted definition of a Smart City, nor does India have any national policy on urbanization. Within this science-policy vacuum, there is a fair degree of consensus on what a smart city looks like, but no understanding on what are the inputs and strategies to achieve one. With numerous expectations, inhibitions and euphoria around this theme, this paper attempts to systematically investigate what is a smart city, how it is different from similar prototypes like a sustainable, green and low-carbon city and what are the global best practices. The article addresses some of the ideological, technical, societal, governance and financial challenges that India faces to attain the '100 Smart Cities' goal, and what would be its policy implications. In the process, the research proposes a new idiom for SMART—Sustainability, Metrics, Adaptiveness, Reporting, Technology for Inclusiveness.

Keywords Smart cities · Best practices · Issues and challenges
Quality of life · SMART framework

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M. Sethi and J.A. Puppim de Oliveira (eds.), *Mainstreaming Climate Co-Benefits in Indian Cities*, Exploring Urban Change in South Asia,
https://doi.org/10.1007/978-981-10-5816-5_10

1 Introduction

As the saying goes, the road to the city of emeralds is paved with yellow bricks. Throughout human history, urban settlements have been centres of business, talent, entrepreneurship, wealth, ideas, art and culture. In 1800 only 3% of people lived in a city of 1 million or more. In 1950 there were only 83 cities worldwide with populations over 1 million; by 2007 there were 468. In April 2008, the world passed the 50% urbanization mark (UNDESA 2011). With more than half of the world's humanity now living in urban areas, some of it in most abject poverty, destitute and vulnerable circumstances, it is evident that the path to sustainable development must pass through substantially improving quality of life in cities. The role and responsibility of cities is undoubtedly increasing in international debates of economy, environmental governance and sustainability. They are estimated to contribute 70–80% of global gross domestic product and likewise accountable for 70–80% of greenhouse gas (GHG) emissions that cause global warming (World Bank 2010; UN Habitat 2011). The global urbanization trend is creating an urgency to find smarter ways to manage the accompanying challenges (Nam and Pardo 2011), and make cities more competitive and livable. UN Habitat forecasts that by 2050, the global urban population would comprise 75% of the planet's humankind and seeks a larger role of cities in Sustainable Development Goals (SDG), that replace the Millennium Development Goals and post 2015, steer the world's future growth trajectory. The SDG has set a goal to 'Build inclusive, safe and sustainable cities and human settlements' (under Goal 11: Sustainable cities and human settlements) in one of the recent Working Group meetings. The Seventh World Urban Forum (WUF) in Medellin pledged to convert cities into 'inclusive, safe, prosperous and harmonious spaces for all', which was eventually concurred in the New Urban Agenda adopted at the UN Conference on Housing and Sustainable Urban Development (Habitat III) in Quito, Ecuador. Meanwhile, India has focused upon developing a climate resilient infrastructure and urban centres in its Intended Nationally Determined Contribution submitted before the recently convened UNFCCC COP21 at Paris in 2015 (MoEF 2015). The need for smart and livable cities is becoming clearer and louder.

India on its development pathway faces an uphill urban challenge. According to the 2011 census, about 32% (377 million) of the country's population lived in urban areas as against 28% in 2001 and 17% in 1991. Projections of Census of India 2011 data suggest that the urban population is about to grow at a pace of 2.83% from 340 million in 2008 to 590 million in 2030, living in at least 60 cities with a population of more than one million (Mckinsey 2010; MoUD 2011). By 2039, most estimates consider India to be 50% urbanized. To keep pace with that, India would have to spend $1.2 trillion in its urban areas. A critical challenge for cities is that while these are meant to constantly guzzle economic growth engine from fossil fuels and absorb labour migrating from rural areas, these are simultaneously expected to reduce their emission footprints by becoming smart. With the recent announcement of 100 new Smart Cities, the Government of India has strategically responded to both the

international and the domestic audience. Worldwide there is a call to battle global challenges like climate change, poverty, inequality and sporadic development in developing societies through transformative sustainability, innovations, livability and low-carbon societies. Meanwhile, there is a smoldering demand from Indian urbanites for enhanced economic growth, job creation, systems efficiency, urban renewal, municipal reform and international level of quality of life.

The Union Budget earmarked Rs. 7060 crore (70.6 billion) during the 2013–14 financial year for developing 100 'Smart Cities' in the country. Announcing this in his budget speech, the finance minister said that the prime minister has a vision of developing 100 satellite towns of larger cities as 'Smart Cities'. The government will also modernize existing mid-sized cities under the programme. 'With development reaching an increasingly large number of people, the pace of migration from rural areas to cities is increasing. The new cities should be developed to accommodate the burgeoning number of people. Otherwise, existing cities will soon become unlivable' (PTI 2014). Very soon, these advanced, intelligent and livable human-ecosystems are set to find their foot in India. But in the initial one year there were little details divulged on what the Government perceives as a Smart City and what would be the means and methods to achieve 100 of them in the next five years. The long silence was interrupted by the Union Urban Development (UD) minister himself, saying that, "Smart Cities should bring quality of life with inclusivity". The minister discussed future urban development plans and further suggested that there would be two different schemes, one for renewal of 500 urban habitations (now known as the Atal Mission for Rejuvenation and Urban Transformation or AMRUT) and the other for 'Smart Cities' (Zee News 2014). Meanwhile, the overall allocation for the sector was hiked by a whopping 133% in the 2014–15 budget. The UD ministry was allocated Rs. 17,628 crore (176.28 billion) in 2014–15 as against Rs. 7548 (75.48 billion) during 2013–14. In a bid to bring in more foreign investors and help them develop projects in smaller cities, the finance minister announced the government's decision to not only reduce the minimum carpet area criteria for construction to 20,000 m^2 from the existing 50,000 m^2 but also to reduce the minimum capital to US$5 million from US$10 million with a three-year post lock-in. All the above indicated that the Government perceives 100 Smart Cities more as a massive Greenfield project that is set to change the landscape of this country. In the initial media reports, it was reported that 7 out of 25 Smart Cities are to be planned in the first phase of Delhi Mumbai Industrial Corridor. There would be one each in Uttar Pradesh, Haryana, Rajasthan, Maharashtra, Madhya Pradesh and two in Gujarat. The leading one in the pack being Gujarat International Financial Tec-City in about 886 acres, while Dadri-Noida-Ghaziabad Investment Region extending over 50,000 acres in Uttar Pradesh is also being commissioned (Indian Express 2014). The contours of this scheme have become clearer with the launch of the Smart Cities Mission (SCM) in mid-2015 that offers a blueprint for planned urban development (for provisions and features of the SCM, see Box 1).

But there seem to be certain unsettled issues and challenges in this upcoming venture. There is neither an internationally accepted technical definition of a 'Smart City', nor does India have any national policy on urbanization. Within this

science-policy vacuum, there is a fair degree of understanding on how some of the Smart Cities will look, but no consensus on what are the inputs and strategies to achieve one. With numerous expectations, inhibitions and euphoria around this theme, this chapter attempts in Sect. 2 to systematically investigate what constitutes a Smart City, and how it furthers the concepts of a livable, sustainable, green and low-carbon city. Global best practices are explored in Sect. 3. Section 4 addresses some of the major challenges—ideological, technical, societal, governance and financial—that India faces to attain the '100 Smart Cities' goal and its policy implications. Consequently, the research explores new possibilities in Sect. 5 that could serve as a new idiom for Smart City, while Sect. 6 presents the research conclusion.

Box 1: Smart Cities Mission: Provisions and Features

The Government of India launched the Smart Cities Mission (SCM) on 25 June 2015. The mission acknowledges that cities are engines of growth for the economy of every nation, including India. The SCM accepts that there is no universally accepted definition of a Smart City. It asserts that a Smart City would have a different connotation in India than, say, Europe. Even in India, there is no one way of defining a Smart City. 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 Mission will cover 100 cities and its duration will be five years (FY 2015–16 to FY 2019–20). The SCM lists ten core infrastructure elements including water, electricity, waste, mobility, housing, environment, health and education. It also illustrates over 20 technology supported 'smart solutions'. In addition, the SCM offers some typical features of comprehensive development in Smart Cities, that include promoting mixed land use in area-based developments, housing and inclusiveness, creating walk-able localities, preserving and developing open spaces, promoting a variety of transport options, making governance citizen-friendly and cost effective, giving an identity to the city; and applying Smart Solutions to infrastructure and services. With no further checklists, parameters and indicators defined, the SCM features are empirically difficult to measure, verify and report.

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. The Government does not prescribe any particular model to be adopted by the Smart Cities. The approach is not 'one-size-fits-all'; each city has to formulate its own concept, vision, mission and plan [Smart City Plan (SCP)] for a Smart City that is appropriate to its local context, resources and levels of ambition.

The SCP may include assured electricity supply with at least 10% of the Smart City's energy requirement coming from solar, adequate water supply including waste water recycling and storm water reuse, sanitation including solid waste management, rain water harvesting, smart metering, robust IT connectivity and digitalization, pedestrian friendly pathways, encouragement of non-motorized transport (e.g. walking and cycling), intelligent traffic management, non-vehicle streets/zones, smart parking, energy efficient street lighting, innovative use of open spaces, visible improvement in the area (e.g. replacing overhead electric wiring with underground wiring, encroachment-free public areas, and ensuring safety of citizens especially children, women and elderly).

The criteria for selecting Smart Cities is based on nomination by States/UTs (Union Territory) cum competitive selection. The total number of 100 Smart Cities have been distributed among the States and UTs on the basis of an equitable criteria. The formula gives equal weightage (50:50) to urban population of the State/UT and the number of statutory towns in the State/UT. Based on this formula, each State/UT will, therefore, have a certain number of potential Smart Cities, with each State/UT having at least one.

The implementation of the Mission at the City level will be done by a Special Purpose Vehicle (SPV) created for the purpose. The SPV will plan, appraise, approve, release funds, implement, manage, operate, monitor and evaluate the Smart City development projects. Each Smart City will have an SPV which will be headed by a full-time CEO and have nominees of Central Government, State Government and urban local bodies (ULBs) on its Board. The States/ULBs shall ensure that: (a) a dedicated and substantial revenue stream is made available to the SPV so as to make it self-sustainable and could evolve its own creditworthiness for raising additional resources from the market; and (b) Government contribution for Smart City is used only to create infrastructure that has public benefit outcomes. The execution of projects may be done through joint ventures, subsidiaries, public-private partnership (PPP), turnkey contracts, and so forth, suitably dovetailed with revenue streams.

The SPV will be a limited company incorporated under the Companies Act, 2013 at the city-level, in which the State/UT and the ULB will be the promoters having a 50:50 equity shareholding. The private sector or financial institutions could be considered for taking an equity stake in the SPV, provided the shareholding pattern of 50:50 of the State/UT and the ULB is maintained and the State/UT and the ULB together have majority shareholding and control of the SPV. Funds provided by the Government of India in the Smart Cities Mission to the SPV will be in the form of tied grant and kept in a separate Grant Fund. These funds will be utilized only for the purposes for which the grants have been given and subject to the conditions laid down by the Ministry of Urban Development. The SPV may appoint

Project Management Consultants (PMC) for designing, developing, managing and implementing area-based projects.

The Smart City Mission will be operated as a Centrally Sponsored Scheme (CSS) and the Central Government proposes to give financial support to the Mission to the extent of Rs. 48,000 crores (480 billion) over five years, that is, on an average Rs. 100 crore (1 billion) per city per year. An equal amount, on a matching basis, will have to be contributed by the State/ULB; therefore, nearly Rupees one lakh crore (1000 billion) of Government/ULB funds will be available for Smart Cities development. The Mission would be monitored by an Apex Committee at the national level, a High Powered Steering Committee at the State level and a Smart City Advisory Forum at the city level.

Source: MoUD (2015).

2 Deciphering Smart Cities in Literature

With the emergence of sustainable development on the global consciousness (Brundland Commission: Our Common Future in 1987; World Summit on Sustainable Development, Rio in 1992), Sustainable Cities became a favourable but challenging goal for future human development. These cities converge economic growth, environmental conservation and social well-being while maintaining inter-generational equity. With the growing importance of climate change and GHG emissions dawning upon the global environmental discourse, this trend was followed by a much nuanced approach to aim for a low-carbon city which could essentially reduce the carbon footprint of its citizens by mitigating harmful impacts from industries, transportation, thermal power plants and municipal waste. Meanwhile, the concept of 'quality of life' and livable cities aims to represent how well human beings' needs are met or the extent to which individuals or community perceive satisfaction in various domains of urban life (Costanza et al. 2007). Since the early 2000s, the concept of Smart City, understood as the new process of urbanization, is being seen as a tool to realize some of these concepts on the ground and has become quite fashionable in the policy, entrepreneurial and academic arena.

According to recent reports, Stanford University's research shows that there are currently around 150 Smart City projects ongoing or completed. Most of them are found in Europe (47), Asia (40) and North America (35). Smart City is also used as a marketing label by companies and the cities themselves to guide their urbanization and enhance global competitiveness. Top IT-based leading companies have targeted Smart Cities as its main markets and blue oceans of business development. Furthermore, academia is also increasingly embracing the topic of Smart Cities as one of the hottest emerging research areas launching postgraduate courses and research lines centred exclusively on the theme (CIDOB 2014). Surprisingly, in spite of so much of the buzz around Smart Cities, with numerous agencies

promoting, evaluating and developing them worldwide, there is a great deal of ambiguity even on its normative definition, parameters and international authority for standardization. While some argue ISO 37120: 2014 to be the standard indicator for Smart Cities, the International Organization for Standardization itself designates them as 'Sustainable Development of Communities—Indicators for City Services and Quality of Life'. They are basically an extension of the Global City Indicators Facility, initially sponsored by the World Bank (World Bank 2008).

For the scope of this investigation, the scholarly definition of Smart Cities is, "Cities where investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance" (Caragliu and Nijkamp 2011, p. 6). Smart Cities highlight important aspects of sustainability, such as the need for responsible resource management, energy efficiency, and citizen engagement (Colldahl et al. 2013). Furthermore, they could be understood with six characteristics, namely: smart economy, smart people, smart governance, smart mobility, smart environment and smart living (Giffinger et al. 2007, p. 11). The concept is intricately related to intelligent, innovative or knowledge-based settlements that mobilize information and communication technologies (ICT) to deliver better services, reduce carbon footprint, create sustainable environments and improve living conditions. The core idea behind Smart Cities could be better interpreted through their best practices evident across the globe.

3 A Global Review of Best Practices in Smart Cities

Famous examples of Smart Cities include cities like Tokyo, New York, London, Shanghai, Yokohama, Kawasaki, Singapore, Barcelona, Amsterdam, Vienna, Rio de Janeiro, Brisbane, Stockholm, Copenhagen, Toronto, and so forth, while relatively non-descript ones include Kitakyushu (Japan), Songdo (South Korea), Masdar (Abu Dhabi), Skolkovo (Russia), Dubuque (US) and several in China like Meixi, Tianjin knowledge city, Suxhou, Guangzhou and Szechuan. A global review of Smart Cities reveals a great deal of variety in their scale, economic structures, technological innovations and sectoral priorities. For instance, while Tokyo and New York are mega city-regions and international financial hubs, cities like Songdo is confined to 1500 acres near the Incheon international airport while Dubuque, that proclaims itself to be the first Smart City in the US, has a population of only 60,000. By Indian standards, that may only translate into a modestly dense middle-income locality or a portion of *Dharavi* slum in Mumbai.

The winners' podium of the world's 'smartest' cities is occupied by Tokyo, London and New York, respectively, for the third consecutive year (IESE 2014), among 135 cities on 50 indicators along 10 different dimensions that are (with the city topping that dimension in parentheses): *Governance* (*includes citizen and business engagement,* Auckland is the top city in this area), *Public Management*

(Tokyo), *Urban Planning* (Berlin), *Technology* (London), *Environment* (Zurich, Geneva and Basel), *International Outreach* (London), *Social Cohesion* (Eindhoven), *Mobility and Transportation* (Berlin), *Human Capital* (Tokyo), and *Economy* (New York). Like IESE there are rankings by several other agencies. Based on their own valued reasoning, some top rated Smart Cities include Vienna, Toronto and Paris (Cohen 2014) and Singapore, Hong Kong and Curitiba (Kotkin 2014, featured in Forbes).

The global review demonstrates that cities have either targeted different sectors or in fact intermittent co-benefits to become smart. Japanese cities like Yokohama, Kawasaki, Kitakyushu, and Toyama have pioneered the multi-sectoral co-benefits, covering renewables like solar energy, the waste sector including segregation, load and emission reductions, smart grids with community and household energy management systems in place, and e-mobility that prioritizes light rapid transit and electronic vehicles (IGES/YCU 2011). Certain cities have started with one major sector. Singapore with heavy investment in its public transportation infrastructure succeeded in creating one of the most modern, affordable and highly used public transport networks in the world. London has similarly worked to ease traffic congestion leading to variable pricing for road tolls. Sacramento in California has focused on the power sector, installing 615,000 smart meters at customer premises through home area networks, which in turn are connected to an advanced metering infrastructure network. These smart meters enable adjusting electricity consumption within houses in tune with grid supply so that black or brown outs are proactively avoided. European cities are increasingly moving towards e-governance related co-benefits using automated revenue collection systems. In Amsterdam, the Digital Road Authority mines different types of traffic data to provide services such as on-demand parking space, and expected travel time to users, thus reducing congestion, waiting time and the associated air pollution, thereby improving road safety and quality of living of its citizens (Vembu and Sridhar 2014). Similarly, Copenhagen moved to smart travel cards for seamless travelling between various transport modes, facilitating shopping and payment of bills. Madrid plans to invest about US$20 million in a technology platform to manage a range of public services such as street maintenance, lighting and waste management. There are other cities that have initiated particular 'smart' solutions like Dubuque in Iowa, which operating on a fairly limited budget recently completed a three-year pilot project to install smart electricity and water meters. Smartness is involved in data collection, often in real time, leading to efficient decision-making. Rio de Janeiro, for example, monitors real time data from 30 agencies streaming into an operation centre from where responses to emergencies and accidents are efficiently coordinated. Similar measures in other cities include using Global Positioning System-assisted waste removal, helium gas-aided water pipeline leakage detection and a smart card facility for citizens for various services.

Meanwhile, there is a growing evidence of cities in middle- and lower-income countries taking advantage of technology to create co-benefits. While identifying Smart Cities for an award for the period 2007–2011 in the Asia region (on the basis of broadband connectivity; a knowledge-based workforce; digital inclusion;

innovation; and marketing and advocacy), three Indian cities—namely Bangalore, Hyderabad and Jaipur—figured in a list of 20 cities from the region (Ramachandran 2014). Modest beginnings made by other Indian cities could not be overlooked; for instance in Delhi, the municipal corporations have an online system to disburse birth/death certificates and enable people to pay some of their bills and property taxes. In Bangalore, real time technology relays information of bus timings, congested routes and so on; and in Indore, the traffic police have installed infrared devices to nab rule violators (Narayan 2014). Meanwhile, a city like Lavasa near Pune, has recently woken up and repackaged its technical prowess for the coveted 'smart' tag. The investigation of global best practices in Smart Cities shows the growing use of ICT in energy and mobility sectors or specific solutions in others. This has come about as a natural evolution for the developed countries that have already addressed issues of physical and social infrastructure and now need to gain immediate results in resource consumption, energy efficiency, cost recovery, business and civic engagement to ensure global competence and internal sustainability. India, which is increasingly becoming connected to the global systems will have to take this challenge to leapfrog into Smart Cities.

4 Issues and Challenges to Generate 'Smart' Co-benefits

In practice, actualizing Smart Cities to generate several co-benefits poses a formidable test. The SCM identifies some challenges that arise in this process that include competition among cities, support and leadership roles played by States and ULBs, capacity assistance required by stakeholders, prior investments of time and resources in the planning phase and pro-active participation of people (MoUD 2015). Indeed, Smart Cities not only seek technological leapfrogging but a giant leap of faith. Unlike smart phones and smart card technology, Smart Cities could neither be imported nor transplanted; they rather need to be adapted to the local context and assessed for their value to sustainability. This poses numerous intervening issues and challenges as discussed below.

4.1 Ideological Challenges

India in the past has had a sort of love–hate relationship with urbanization. It primarily started with the pressing need to resettle in-migrants after partition of India in 1947. This was followed by a perception of cities as a 'necessary evil' while modern industrial and capital towns came into being (believing India lives in its villages, cities were regarded as a social threat). Post-1970s drew a gradual attitude of acceptance (as the Census noted the realities of rural-urban migration, growing urban slums that led to commissioning of several development authorities, counter-magnets and *awas yojna* projects). The economic liberalization era from

1991 onwards has viewed urbanization as a challenge. While the private sector capitalized upon it through real estate, the government made attempts with the National Urban Renewal Mission (JNNURM), *Rajiv Awas Yojna,* Provision of Urban Infrastructure in Rural Areas, and so forth, with varying interventions and results. Today, India stands at a crossroads as the new government has taken urbanization head on as an opportunity, with a dream to improve quality of life (QoL) by making the cities smart. In this regard, it becomes vital for the government to clarify its vision and strategy for Smart Cities, considering the fact that there is no universally accepted definition and metrics. To make the matters complex, India does not have a national urbanization policy that could provide a blueprint to how many, what kind of cities should come where and when. This raises doubts of whether 100 new Smart Cities would put conventional urban-regional theories, scientific, integrated and multi-level planning head over heels? Indeed, this has been a practice with previous public policies, more as a norm than an exception while commissioning special economic zones, industrial areas, development authorities, transport corridors that had little or no relevance to regional needs, resource base, land use, district and local-level planning whatsoever. The present ravaged landscape of the country today is a mute witness to indiscriminate abuse and misuse of agricultural lands, non-compliance of regulations by authorities, intermittent and patchy urbanization, urban fringes, sprawls, squatter settlements that the entire country's urban arena seemingly portrays a slum and filth in continuity. The government will have to convince the citizens that if '100 Smart Cities' are to be seen as an opportunity, how will it collectively and effectively contribute to India's aim of sustainable urbanization and enhancing QoL? Will this scheme provide a paradigm shift from a prevailing pattern of unchecked migration, urban growth and rural-urban divide? After all, inequity of energy, resources, income, infrastructure, socio-economic facilities between urban and rural areas is a direct consequence of poor planning, industrialization and urbanization patterns in the past.

Even amongst and within the cities there is a stark disparity in their QoL and availability of municipal services. In 2011, the urban development ministry surveyed 1405 cities in 12 Indian states and found that more than half of them do not have full access to either piped water supply or sewage systems; that 80% of the households there get water for less than five hours a day; and, more gravely, over 70% do not have access to toilets. Between 2001 and 2011, India's urban population grew from 27 to 31% of the national population, but the urban infrastructure hopelessly lagged behind (HPEC 2011; Narayan 2014). Some Indian cities or specific localities within them desperately call for a basic level of urban amenities and quality of life. While certain facilities like water and electricity are being actually wasted by some rich and upper middle-class people and definitely need to be plugged, but comparing against the developed countries, these are still being consumed at one-third to one-fourth of the level on a per capita basis. With such global and local inequities amongst the population at large, the ideological challenge is to justify how 100 new IT-savvy cities would balance the prevailing norms.

4.2 Technical Challenges

The ideological challenges discussed above would require exploring tough possibilities and decisions, which could be made relatively easy if the technical challenges in this process are meticulously addressed. Smart Cities would invariably require a network of sensors, cameras, wifi, data centres, e-meters, hand held monitors, smartphone apps, and the biggest of all 'the internet of things'; but what would one do with the data, privacy and security issues? The government would have to face the challenge of managing this big data. Who is going to process it, how and to what purpose? It is generally felt that city councils are in an increasingly complex position to set up and manage open data processes with their own capabilities. Thereby, most find themselves forced to outsource these services to the higher expertise of private sector. But at this point, too much dependency on private initiative and know-how can create a technological loop that compromises the security of data. It risks the system to fail; it diminishes the ownership of data storage; and it deals with the issues about its ethical use (CIDOB 2014). Hence, creating technical capacity at the local body level to handhold the entire process will be an utmost requirement, which could be possible if they are actively engaged as a stakeholder right from the beginning.

In addition to the much-debated ICT component, there are technical issues associated with traditional infrastructure, planning and construction. Indian cities rank very poorly when compared to their international counterparts. New Delhi and Mumbai rank 46 and 52, respectively, on the Spatially Adjusted Liveability Index and 52 and 53 on the Economist Intelligence Unit Liveability Index in 2013 (Financial Express 2014). Joshi-Ghani, urban sector manager at the World Bank, notes that many of the needs of developing countries centre on providing and maintaining modern infrastructure (roads, power plants, water treatment plants, sewage systems, transit systems). Since this built environment lasts a long time, getting the right infrastructure in place shapes a city for decades to come. Planning a city with the right infrastructure, and not merely replicating past practices that have often been haphazard, means relying more on evidence and analysis about how sustainable cities can and should grow (UN/World Bank 2012). In this regard, there is a strong technical basis that as India re-imagines its urban landscape, it needs to focus on making its top 100 cities livable rather than creating 100 new cities. Isn't the idea of creating new cities utopian—belonging to the era of manufacturing-led growth—as we know that India rides heavily on the tertiary wave that is not necessarily location based. This prompts to evaluate each project proposal on its technical merit for the additional time, money and efforts invested in a new city or scheme, given that in the present world an individual can work smartly from the luxury of one's home.

But the biggest challenge that the Government would have to face as it walks deep into this initiative is perhaps not on account of the inherent technicalities of greenfield projects (against the brownfield ones as pointed above), but associated more so with their associated timelines. The ICT technologies are installed at the

end of the construction phase, which involves initial planning, site selection, land procurement, making detailed project reports, issuing tenders, developing land, civil construction, installing services, and so forth. Even if the government is able to manoeuvre time overruns in land acquisition, creating a special purpose vehicle for projects and working on public-private partnership (PPP) mode, it would still be an arduous task for the Smart City to see the light of day in less than 4–5 years. Greenfields appear to be relatively easier and fancier, but very soon the agencies involved would realize that in order to show tangible results to the public, it would have to put its money where its mouth is, that is, treading the challenge of working in a filthy old city. The bigger the risks, the greater the benefits. In practice, leaving aside a few sectors, with part-infrastructure already given, brownfields would turn out to be rather encouraging and affordable giving plausible and immediate relief to their citizens. Best practices across the world show that smart mobility and smart energy are low hanging fruits that ensure multiple benefits and public appeal, while the complex and expensive projects may follow suit. Smart after all, is not just about advanced technology, but being innovative, thinking out of the hat, and enterprising to experiment with little resources at hand. Common sense techniques —walk to work, shaded pathways, car pools, mixed land use, lively street designs and use of natural features and materials in cities—need to be genuinely brought back.

4.3 Societal Challenges

'What is a city, but the people?' said Shakespeare. This necessitates the question whether smart solutions would descend from the heavens or based on societal needs. The global discourse like the New Urban Agenda lays emphasis on social priorities in addressing future needs, advancing towards greater social cohesion, breaking down social divides, promoting participatory and inclusive local governance, and fostering sustainable development. Smart Cities cannot only be about displaying technology and delivering services; fundamentally, they have to be inclusive and equitable places to live in. A strong pursuit of technological innovation without well-defined and targeted inclusive policies can be risky. It is likely to leave lower income and vulnerable populations behind the opportunity path. In the process, the income inequality gap increases and citizen participation can be undermined (CIDOB 2014). If the policy-makers and the practitioners prefer to view Smart Cities as small enclaves on the urban periphery probably out of convenience, these would have the tendency of turning into expensive and exclusive gated communities. It would be the most preferable pathway if given a choice. India has had a long colonial and modern history of exclusive estates like the princely estates, civil lines, bungalow zone, urban farmhouses, rich-suburbs to the recent special economic zones, that only harboured servitude, inferiority and no respectable spaces to the commoners. Is Smart City movement scaling up the gated

community phenomenon to the city level? If the state overlooks the existing city and privileges new enclaves, the urban fabric will split into two unequal halves.

There are some counter arguments to this apprehension. Joshi-Ghani argues that cities are growth escalators, but Smart Cities are more than that. They make urbanization more inclusive, bringing together formal and informal sectors, connecting urban cores with peripheries, delivering services for the rich and the poor alike, and integrating the migrants and the poor into the city. Promoting Smart Cities is about rethinking cities as inclusive, integrated, and livable (UN/World Bank 2012). But is there evidence in support of this assertion. Practitioners who have worked on creating Smart Cities have expressed difficulties in holding effective engagement processes. Further, prioritization processes were often determined by political ambitions and available budgets (Colldahl et al. 2013). For inclusiveness, they made recommendations with respect to sustainable urban development, effective planning, measuring success, engaging stakeholders, and developing actions plans through prioritization processes. As Mischa Dohler, chair professor in Wireless Communication at King's College London, points out, 'big data is not enough, it's just half the way'. Ensuring a pro-poor access to smarter public services is therefore crucial (CIDOB 2014). The SCM must go a long way ahead of merely delivering technical solutions, if they wish to socially walk the talk.

4.4 Governance Challenges

There is a general perception as to whether a Smart City is being passed as the new bottle with e-governance being the old wine. Well, just as a foreign technology has to undergo the test of society, so does it need to find concurrence with the prevailing legislative, policy and administrative framework. In order to explore co-benefits, there are several challenges and unanswered questions; for instance, is prevailing legal and governing environment conducive for 100 new Smart Cities? What role and initiative will the state governments, local government and the private sector have? Theoretically, there could be several mechanism for execution, namely: (i) a flagship programme as had been done previously with schemes like JNNURM, RAY, *Indira Awas Yojna*, Basic Services to Urban Poor under the urban portfolios with nodal agencies in respective states; or (ii) through a separate statutory body created to plan and develop all the 100 Smart Cities in the country; or (iii) through separate special purpose vehicle in every state with Centre, State, ULB as the stakeholders; or perhaps more likely (iv) a combined but modified approach of (i) and (iii) above where both Centre and State oversee fiscal planning and mobilization and at the same time develop Smart Cities on a project mode through either line departments, private agencies or preferably on PPP mode, while ULB is also a stakeholder within a state level constituted authority. The SCM has chosen to adopt the fourth approach in practice, which could work for both greenfield and brownfield projects.

The government would need to clarify how it would treat a Smart City. Is it merely a functional entity or would it have a statutory mandate akin to Exclusive Economic Zones and Special Economic Zones? Like industrial areas, corridor zones and development corporations they could also be governed by separate statutes. Its ideological, technical and societal implications are discussed above. In terms of good governance, there is an already overlapping complex of jurisdiction and functions between authorities created for special purposes and the constitutional agencies at the local level, namely the urban local bodies (ULBs) and the gram panchayats. It needs to be seen with keen interest how the government treads this tightrope. Apparently there is a greater ease in doing business by bringing Smart Cities under a corporate SPV or a new act, considering that manufacturing, foreign direct investment and greenfield development seem to be the key generator; rather than taking a more nuanced, demanding and unprecedented approach of building capacities within the ULBs to plan and manage Smart Cities by themselves. The latter could have led to better devolution of powers to the local bodies as mandated by the 74th Constitutional Amendment Act 1992. It needs to be underscored that municipal governments can play a vital role during implementation and creating synergies with the existing city. In fact a common authority will command citizen participation, ownership and global brand equity for both the parent city and the Smart City and could lead to a new sunrise for the urban bodies in the modern history of India.

It needs to be appreciated that Smart Cities should not turn out as centre's edifices or white elephants at the local level. There needs to be a fine balance of roles and responsibilities of the centre, state, local governments and the private sector for integration of several systems. The role of the private sector also needs to explore which ICT provider has the expertise of basic services and infrastructure. Probably none. In fact execution of ICT services comes at the far end of the project, though their technical inputs would be significant during the planning phase (in case of new projects). Resting the entire project onto an individual technology provider could not just turn out to be technically unwise, financially risky but a major managerial challenge. PPP should rather support a much wider technical participation from the private sector on multiple criteria: allow consortiums, joint bidding, and possibly sub-contracts to local enterprises. The Government also needs to devise a system that promotes healthy competition between cities and at the same time be flexible to offer opportunity for late comers, unlike in JNNURM.

4.5 Financial Challenges

India's steady urbanization has the potential to bring in investments of Rs. 120–150 trillion over the course of the next 11 years until 2025, says the Kotak Institutional Equities report entitled 'Multiplicities'. Though several aspects of finance have been discussed in previous sections, a few challenges in particular seek attention. Going by the commitment of the SCM, Rs. 200 crore per Smart City

serves as a stepping stone as the physical infrastructure saps high investment. Co-benefits of Smart Cities are normatively undoubted but the most critical question is at what price? And accordingly, what are the cost recovery mechanisms? In the words of the Songdo's International Business District CEO, 'the city itself is just a normal city with state-of-the art technology that struggles like any other city to attract citizens and firms to settle down' (CIDOB 2014). The Smart Cities would have to come up with their own non-traditional and innovative ways of self-sustenance, in addition to the financial provisions within the SCM.

This prompts to ponder the role of the state and local government in question, and would it also involve a similar sharing of liabilities and profit? The above questions become important because India has not had a spectacular track record in inviting foreign investments in the manufacturing sector while investments from urban programmes like JNNURM in the past have ended up as an asset creating black hole. Secondly, if cities are developed on PPP mode as increasingly finding favour in government policy, amassing of land and its monetization is inevitable as it is the most vital cost-recovery component (as well as the most controversial). But the government would have to ensure that the SCM does not turn into another land grabbing real estate venture that anticipates higher returns as time over-runs. There need to be sufficient checks and balances in its financial planning, implementation, contracts, risks and liabilities. Moreover, the initial commitment should be used as a seed fund, and every effort should be explored to make Smart Cities self-sustaining. Cities ought to be smart when it comes to investments, project costs, gauging demand and supply, return on investments, for example. There should also be due financial consideration for maintenance and overheads during the implementation phase, capacity building of stakeholders, and so on.

5 Possibilities for 100 Smart Cities

In view of the global challenges, cities need to serve as living laboratories to deal with complex intervening issues like job creation, poverty and inclusion, freedom and democracy, safety and security, innovation, economic growth, global competitiveness, climate change, and so forth. In order to address the above discussed challenges, this research puts forward a series of possibilities to shape 100 Smart Cities in India, keeping in view Sustainability, Metrics, Adaptiveness, Reporting, Technology for Inclusiveness (collectively forming a new acronym for SMART):

S—Sustainability: Smart Cities should be taken as a logical opportunity to realize this challenge, with sustainable urbanization as the overarching goal. The government's decision to formulate a new urbanization policy with a vision for the next 25–30 years would go a long way in creating this. Land and urban planning are a state subject, but urbanization is a regional and national phenomenon with increasing global associations like globalization, climate change, and so on. The government should consider what should be its priority, to make '100 Smart Cities', 100 'Smart' cities or 100 'Smarter' cities. The basic idea should be to refrain from

being over-ambitious, splurging settlements, as happened in the past—governments either abetting unplanned, squatter settlements that were then regularized later or else creating ill-planned economic zones, industrial and real estate townships sprawling over the landscape with no genuine takers. Sustainability also mandates to be flexible and adaptive with the laws of nature. Given the fact that the existing cities which host a bulk of the population in old localities, waste a lot of resources, are highly energy-inefficient and the ones that urgently require smart solutions. At times redeveloping dilapidated parts of a city may bring greater co-benefits than sub-urbanization. Global cities have time and again proved this through urban revival. Similarly, decentralized action in municipal services, traffic, waste and wastewater management and participation of people could create greater co-benefits, in spite of having a centralized control over data. In fact 'smart', 'livable' and 'sustainable' goes hand in hand.

M—Metrics: Smart Cities are all about finding and implementing suitable metrics, which forms the bedrock for transparency, objectivity and rational decision-making. The absence of a standard definition in this regard should rather be taken as an advantage. The state needs to adopt a normative basis for its Smart City concept considering the Indian context, decide the main objectives, its components and devise suitable indicators like quality of life, inclusiveness, level of services/performance and so forth, to be adopted during planning and implementation. Drafting of guidelines, toolkits, laying procedures for public and stakeholder participation needs attention. Incite specific ideas and problems from experts and stakeholders. Employ back-casting to do scenario analysis and find solutions. Make a checklist of doable actions, monitoring plans and reporting structures.

A—Adaptiveness: Smart Cities would need to adapt according to India's federal governance frame—which cuts across jurisdictions, sectors and spatial scale. Since land development is a State subject, their enthusiastic participation is crucial. The Government has to put in place a detailed framework to guide investment and demarcate responsibilities. The policy alternative (iv), a combined but modified approach, discussed in Sect. 4.4 seems more credible, where centre and state oversee fiscal planning and mobilization and simultaneously develop Smart Cities on a project mode or PPP mode, including ULB as a stakeholder. This could work for both greenfield and brownfield projects. Funds are only one part of the problem. The key challenge would be to overhaul urban governance and infrastructure, both physical and digital and explore the possibility of a cross-subsidy between one another at various project stages. Before initiating a robust scheme that could give excessive powers to technology providers of private origin, who essentially fall short of adequate skills and experience associated with non-ICT infrastructure at the city scale, it may be worth developing few prototypes in upcoming cities where basic infrastructure is already in place.

R—Reporting: Cities around the world are using big data on a range of urban issues including transport, employment, migration, housing and education to generate savings, promote innovation and make cities a better place to live and work (Centre for Cities 2014). As such the projects focus on how big data can be presented in an easy to interpret and/or visually compelling way. In the USA, for

example, cities such as New York and Boston have seen the development of mobile apps and service improvements through making data available to all. Since there is no precedent of a planned Smart City in India, there is a need to simultaneously create and share knowledge through documentation, reporting and creating knowledge networks, while actualizing projects on the ground. Tim Campbell in his book *Beyond Smart Cities* acknowledges that learning networks tend to form between cities that share similar levels of development, socio-economic context, and challenges (CIDOB 2014). This would not only serve into the feedback loop but also lead to horizontal expansion of the Smart Cities movement.

T—Technology for Inclusiveness: Technology should work with the motto 'citizen first'. Directly linked to the empowerment of citizens and local institutions, technological change is driving urban transformation. For instance, opening the 'black box' of urban data stored in the hard disks of public computers has been another major breakthrough in promoting local level participatory planning. Concepts such as 'open data' and 'big data' refer to the facilitation of public data to public consultation and its processing for a social service-based use (CIDOB 2014). Technology serves as a medium to attain a higher ethical, socio-economic and public good. Holland (2008) views this internalization as the Smarter Cities. Existing educational and technical institutes should be pressed into service to handle urban data for innovation and practical use. Joshi-Ghani sees in this a key to adapting 'Smart City' precepts. The concept of 'Smart Cities', she says, is 'really about good governance. It's about giving basic services to our citizens. It's about livability. It's about how we are using our resources. It is how a city functions on a day-to-day basis. I think smartness is about doing more with less' (UN/World Bank 2012). In this regard, the importance of amenities like potable water, clean and noise free surroundings, space to walk and commune, safety and security, health and hygiene, reliable power supply, hassle free civic services for the most simplest of things like bill payments, issuance of birth/death, marriage certificates, forms attestation, police verification, and so on, could not be undermined. It is the provision of these petty small solutions that technology could bring immense value to the lives of common people.

6 Conclusion

This research started with some fundamental inquiries about Smart Cities like what they really stand for—international best practices, probable challenges and possibilities to achieve 100 new Smart Cities in India. The research reveals that, in spite of having no internationally accepted definition or a national urbanization policy in India, nonetheless the Smart Cities Mission holds immense potential to achieve multiple co-benefits of sustainability, systems efficiency, economic growth, participatory governance and better quality of life. While techno-financially, building a Smart City does not seem to be much of a complex issue, the biggest challenge is to fuse it with the existing urban, governance and social fabric of the country. This

could be fulfilled effectively if SCM maintains focus on sustainable urbanization, good governance, transparent metrics and reporting. As evident, most measures aimed at enhancing QoL and co-benefits are realizable in transport, energy, and so on, though social sectors like education, health, basic amenities also need to be simultaneously prioritized. Thus the mission should keep people in the spotlight because what the large and burgeoning urban populace aspires to embrace is a safe, inclusive and sustainable fold of urbanization, to which 100 new Smart Cities is the yellow brick paver.

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