Chapter 9
Indian Smart Cities and Their Financing: A First Look

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Abstract The extant international literature on smart cities, which are conceptualized and designed to enhance the quality of well-being, fails to provide a homogeneously unifying definition of smart city. This lack of comprehensive knowledge manifests into a critical policy challenge to policy managers responsible for creating and managing complex contours of evolution of smart cities. Smart cities, however, are increasingly becoming a subject to public debate worldwide, which appears to be a strong value-enhancing approach to managing future cities. This paper critically reviews the existing definitional conceptualization of smart cities and their changing frames in global setting across a range of criteria borrowed from literature. Further, the research maps a potential Indian smart city (case of GIFT City) on comparable framework of global smart cities with an objective of developing insights into planned efficiency of smart cities in India. The study also examines different strategies of smart city development with a spatial approach and understanding the way in which these strategies can fit into India's urban scenario. The second part of the paper delves into financing of smart cities in India. Having taken into account India's budgetary plans to develop 100 smart cities, we assess the scale and effectiveness of the plans. Given the potential economic profiles of such cities and associated financial outlays, we also explore likely sources of financing for smart cities with a strong focus on risk-return trade-offs.

Keywords Smart cities • Smart city finance • Smart city mapping • Definition • Strategy

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F. Seta et al. (eds.), *From Poverty, Inequality to Smart City*, Springer Transactions in Civil and Environmental Engineering, DOI 10.1007/978-981-10-2141-1_9

9.1 Introduction

The urban population of the world has raised from 29 % in 1950 to 50 % in 2008 and is expected to increase further to 70 % by 2050 (Nations 2008). While the current urban population in India is around 31 % of the total population, contributing 60 % of country's GDP, it is projected that urban India will contribute about 75 % of the national GDP in the next 15 years (GOI 2014). With an urban population of 31 %, India is on the verge of transition where the pace of urbanization will boost up. It is in this context that the government has decided on developing 100 "smart cities" in the country. In the financial budget of 2014, the finance minister rightly said "Unless, new cities are developed to accommodate the burgeoning number of people, the existing cities would soon be unliveable" (GOI 2014). The study is broadly done in two parts: the first part is conceptualizing smart cities and the second part is about financing of smart cities. This lacks a standardize definition, and the understanding of smart cities formed the motivation for the first part of the research which initiated with working definitions of smart cities worldwide and understanding it. The research further proceeds with mapping different smart cities of the world on the European Union (EU) reference frame and preparing the logic behind the development strategy of cities. The second part of the study is about financing smart cities given the existing plans and budgetary allocation for 100 smart cities by the Government of India.

9.2 Defining Smart City

Extant academic literature and policy studies fail to provide a homogeneously unifying definition of smart city. The conceptualization and definition of smart city is structured around different names, different circumstances, and different policy outcomes in different countries. Table 9.1 summarizes worldwide working definitions of smart city by different firms, governments, and NGOs.

9.2.1 Grouping the Definitions

Based on the keywords mentioned in different definitions, the definitions were classified in different domains, namely, technology stressed, broader definitions, and unclear. Based on the classification of definitions based on different domains, the inferences were extracted out (Table 9.2).

Table 9.1 Smart cities definition

Institute/firm/group	Definition
The UK (business, innovation, and skills)	"Smart cities a process rather than as a static outcome, in which increased citizen engagement, hard infrastructure, social capital and digital technologies make cities more liveable, resilient and better able to respond to challenges" (GOI 2014).
IBM	"One that makes optimal use of all the interconnected information available today to better understand and control its operations and optimize the use of limited resources" (GOI 2014).
British Standards Institute	"The effective integration of physical, digital and human systems in the built environment to deliver sustainable, prosperous and inclusive future of its citizens" (GOI 2014).
CISCO	"Smart cities are those who adopt scalable solutions that take advantage of information and communications technology (ICT) it increases efficiencies, reduce costs and enhance the quality of life" (GOI 2014).
Accenture	"A smart city delivers public and civic services to citizen and businesses in an integrated and resource efficient may while enabling innovative collaborations to improve quality of life and grow the local and national economy" (GOI 2014).
Natural Resource Defense Council	"A city striving to make itself smarter (more efficient, liveable, equitable and sustainable)" (NRDC 2015).
Smart city council	"A smart city is one that has digital technology embedded across all city functions" (council 2015).
European Union	"A city seeking to address public issues via ICT-based solutions on the basis of a multi stakeholder, municipally based partnership" (POLICIES 2014).

Source: Author's own compilation from various sources

Table 9.2 Grouping the definitions

Domain	Definitions	Keywords	Outcome or deliverables
Technology stressed	IBM	Interconnected information	Control operations, resource optimization
	CISCO	Information and communication (ICT)	Efficient, cost reduction, improved quality of life
	EU	Information and communication (ICT)	Solution provider
	Smart city council	Digital technology	Digitally embedded
Unclear	Accenture	Innovative collaborations	Quality of life, growth in the economy
Broader definitions	NRDC	Process, livable, equitable, sustainable, efficient	Efficient, livable, equitable, sustainable
	BIS	Hard infrastructure, digital technology, social capital, citizen engagement	Livable, resilient, better response to challenges
	BSI	Physical, digital, human systems	Sustainable, prosperous, inclusive future

Source: Author's own compilation from various sources

9.2.2 Preliminary Definitional Analysis

Technology-stressed definitions are mostly given by those companies that are in ICT business. Smart city council is a US-based organization that has led partners such as Microsoft, CISCO, Qualcomm, etc., which are dominating companies in IT sectors. Accenture definition is very generic which does not give a clear idea about the character they expect from smart cities. It fails to articulate the nature of innovative collaborations – whether collaborations are IT related, hard infrastructure, economics, or finance related. Broader definitions are given by Natural Resource Defense Council (NRDC) which is a nonprofit organization based in New York. Business, innovation, and skills (BIS), British Standards Institute (BSI), and Wiki are not engaged in any IT-related business and their definitions are also broader.

9.2.3 Government of India Definition

Government of India's concept on smart cities does not have a definition in words but has components that will form definition. The major difference in GOI's concept vis-à-vis the ones listed in the above table is the inclusion of employment as a critical outcome of smart cities. The concept note says that a large number of people migrate to urban areas in search of jobs, and smart city should cater this demand. Each smart city should have a unique competitive edge of providing employment and economic activities. What is required to achieve the competitive advantage is a clearly defined policy agenda that can be implemented to create and strengthen institutional, social, physical, and economical infrastructure.

9.3 Mapping the Indian Smart City in Global Frame

In the concept note on smart cities, the Government of India has declared the criteria of smart city selection, and what is expected to follow is the announcement of the final list of 100 smart cities. Gujarat infrastructure finance technology city (GIFT) is a city under construction in Gandhinagar. GIFT is a potential city being developed as smart city by the Government of Gujarat and private player IL&FS.

Since the concept of smart city is quite new to India, it is of critical importance for policymakers and stakeholders to understand the potential positioning of Indian smart cities with respect to the global landscape of smart cities. This first requires a deep understanding of technology and development frontier of smart city against which Indian cities can be assessed. Similar exercise has been carried out in the European Union to map smart cities in the EU context. We borrow the methodological framework from the EU study and modify it to appropriate Indian context and specificities.

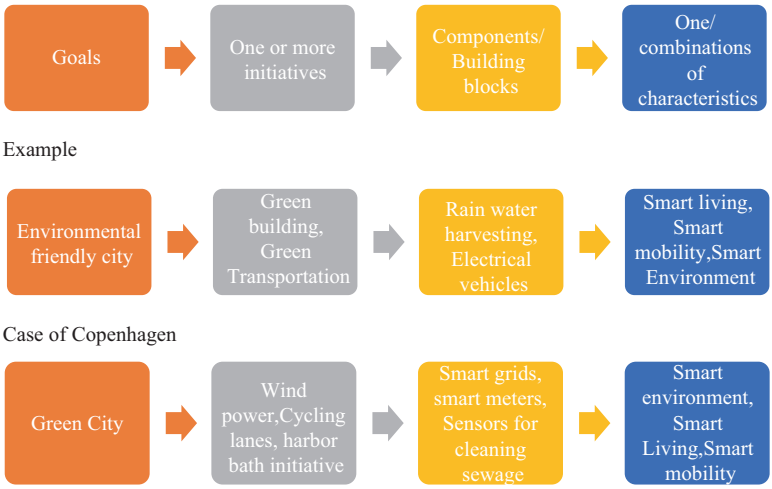

Image 9.1 Relation between initiatives, components, and characteristics (Source: Author's own compilation)

9.3.1 Methodology to Mark Smart Cites

9.3.1.1 Understanding Smart Cities in European Context

European Union describes a smart city that shows at least one of the characteristics of smartness, namely, smart governance, smart Europe, smart mobility, smart environment, smart people, and smart living. The city showing more number of characteristics is smarter than the city showing fewer characteristics.

9.3.1.2 Relation Between Initiatives, Components, and Characteristics (Image 9.1)

The city decides to attain certain goals or missions. For achieving the goals, the city takes certain targeted initiatives. The initiative is divided into smaller tasks, processes, or activities which are components of that initiative. In other words components are building blocks. Characteristics can be identified from these components or directly from the initiative.

Example: Amsterdam (Table 9.3)

Thus, Amsterdam took six initiatives with average 3.33 characteristics per initiative (POLICIES 2014).

Table 9.3 Amsterdam initiatives and characteristics

Initiatives	Characteristics	Initiatives	Characteristics
SC platform	LIV, MOB, ENV, GOV, PEO, ECO	Common 4U	GOV, ECO, MOB, LIV
Citadel	GOV, ECO	Digital cities	GOV, LIV, PEO
NICE	ENV, PEO	Open cities	PEO, LIV,ECO

ECO economy, *ENV* environment, *GOV* governance, *PEO* people, *MOB* mobility, *LIV* living
Source: POLICIES (2014)

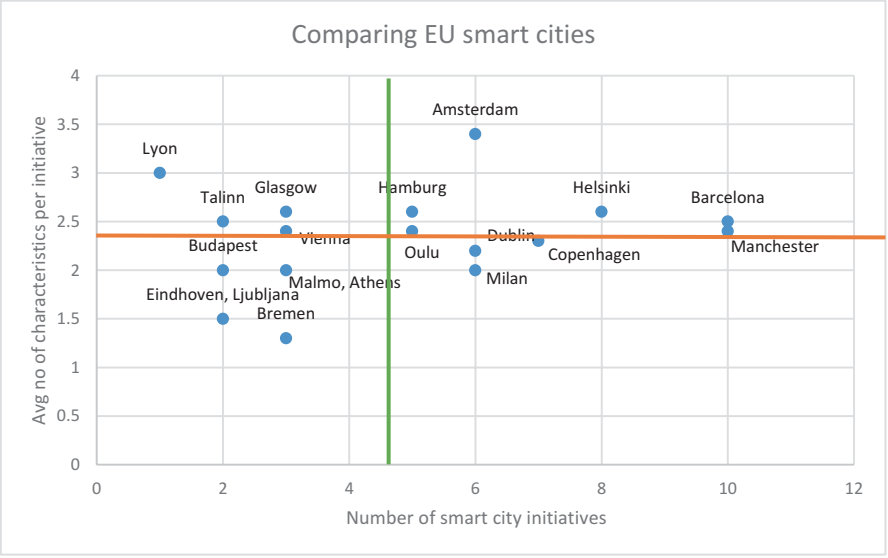

Image 9.2 Comparing European smart cities (Source: (POLICIES 2014))

Table 9.4 Grouping the European cities

Group	No. of initiative	Variety of characteristics	Cities
1	High	Great	Amsterdam, Helsinki, Barcelona, Hamburg, Oulu
2	High	Few	Copenhagen, Manchester, Dublin, Milan
3	Low	Great	Glasgow, Vienna, Tallinn, Tirgu Mures, Lyon
4	Low	Few	Malmo, Athens, Budapest, Eindhoven, Ljubljana, Bremen

Source: POLICIES (2014)

9.3.2 Mapping the Cities (Image 9.2, Table 9.4)

The cities are classified in basically four classes: a high number of initiatives with great variety of characteristics, a high number of initiatives with few varieties of characteristics, a low number of initiatives with great variety of characteristics, and a low number of characteristics with few varieties of characteristics.

It was important to understand the logic behind cities taking a number of initiatives and characteristics in each initiative.

The logic is explained by Image 9.3.

Explanation of the below figure:

High initiative: Since "city of zero pollution" is a broad goal, it needs to take initiative related to green transportation, initiative for governance to monitor industrial pollution, initiative related to waste management, etc., resulting in a large number of initiatives.

Low initiative: A city wants to be a "cycle city." It takes a very much focused initiative to make a "cycle city" like free GPS-based cycle at major location. This goal would not require initiatives related to energy, water, heating, etc. It may also be observed when available resources in the city are less, resulting in taking initiatives in few sectors only (phase wise).

Great characteristics: An initiative is "transport integration." It can be achieved by having intelligent transport system (smart transport), transport apps (smart governance, smart people), etc.

Few characteristics: An initiative is simple, for example, "wind power" which Songdo smart city took covered only smart environment as its characteristics since it will have nothing to do with smart mobility- or smart people-like characteristics.

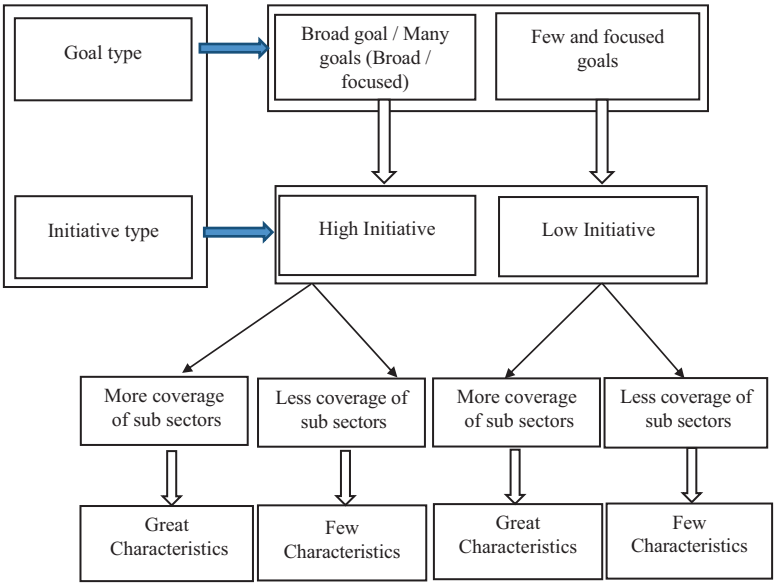

Image 9.3 Logic for initiatives and characteristics (Source: Author's own compilation)

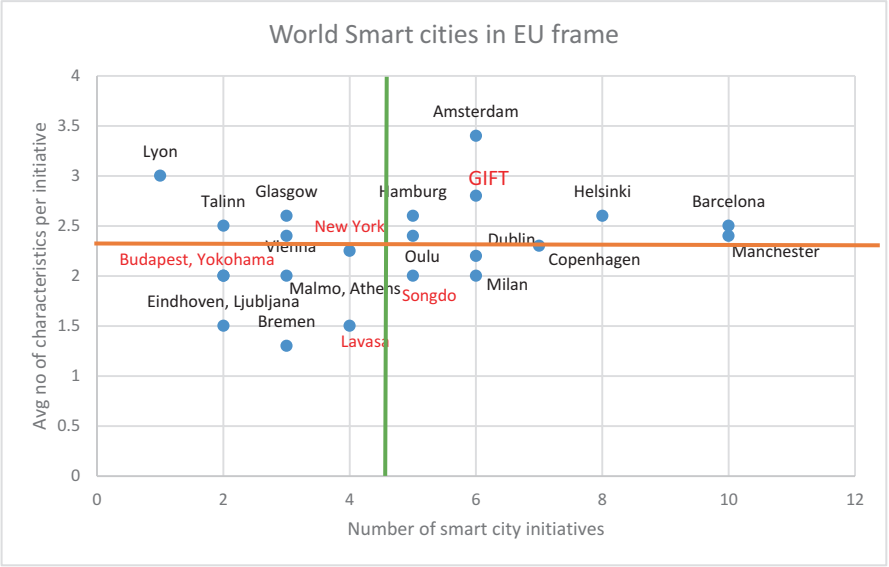

Image 9.4 Mapping smart cities of the world in EU (Source: Author's own compilation)

9.3.3 Inference After Plotting World Smart Cities

The city takes initiative based on its availability of resources, the goal that they seek, the size of city, and many other factors. The cities in the same country do not necessarily have the same initiative and characteristic pattern, e.g., India (Lavasa and GIFT) and Europe (Amsterdam, Budapest, Glasgow, etc.). The number of initiatives and characteristics is highly case sensitive and hence can't be fitted in definite frame. India's plan to develop 100 smart cities should also be a city-centric approach where the initiatives and characteristics depend on the city of subject.

9.4 Smart City Finance

9.4.1 Introduction to Government Plan for Smart City

The government plans to make 100 smart cities in the country. The ambitious project of smart cities requires a large amount of investment which demands huge financing. Such financing is not going to come easily and cheaply to us especially in the light of weaker credit markets. To achieve this gap of funds, it requires a study for understanding different models of finance considering the existing financial condition of the nation.

9.4.1.1 Existing Budgetary Plans for Smart Cities

Per capita the cost for developing 100 smart cities comes out to be INR 43,383 per year for the next 20 years which will include water supply, sanitation, transport, and other infrastructures. If an average figure of 1 million is considered, the fund requirement for the next 20 years will be of INR 35,000 crore per year. So, the total cost for the next 20 years will be INR 7 lakh crore. The majority of contribution from GOI would be in the form of viability gap funding (VGF) (GOI 2014). Initially an investment of INR 5000 crore will be required for preparing a framework for city engagement, city development plan based on GIS mapping, master plan, etc.

9.4.1.2 How Is Smart City Finance Different from Normal City Finance?

Traditional financing is financing of the physical infrastructure of a city or urban renewable projects in which either the cash flow from assets are expected to be used for meeting credit obligation on off-balance sheet basis or existing asset of firms are used as collateral by banks for financing the projects. Smart city finance is different than traditional city financing due to the addition of technology perspective to it. The technologies planned for smart cities are new and still being developed. The use of technology like cloud technology, internet of things, green technology, etc. requires a different type of financial model. These technologies will not be financed by banks as in the case of standard physical infrastructure, and hence innovative modes of finance and business models are required for this purpose. Also smart city is made of innovative start-ups which need to be financed separately. The mode of financing such new idea which cannot be financed by traditional model has also to be new which will be discussed further.

9.4.2 Potential Sources of Financing Smart Cities

Smart city financing can be broadly arranged from debt markets, multilateral financial institutions, and equity markets.

9.4.3 Debt Market

Debt refers to fixed obligation a project or firm owes to a variety of credit providers. It can be raised in the following markets.

9.4.3.1 Banks

Banks have served to be the most promising tool for financing infrastructure projects traditionally, but now it faces severe issues to finance long-term infrastructure projects. To date, the debt financing has been significantly contributed by banks which with significant infrastructure assets already on books are approaching fast toward their debt limit. The total gross nonperforming assets (NPA) of all banks may rise to 4.1 % in Q1, FY 2015 as per ICRA report (ICRA 2013–2014) which is a serious concern for economy, and it is increasing due to bad loans (e.g., Kingfisher, which was declared as a defaulter, had outstanding loan of 3000 crore). The infrastructure sector is a major reason for NPA increase. The sector NPA was 4.66 % in March 09 which raised to 17.43 % in March 13 of the total advances of banks' NPA (Dr. K.C. Chakrabarty, 2013). So, banks are already heavily burdened due to infrastructure projects. Also, banks face a problem of asset-liability mismatch since banks borrow money from retail customers that look for a short tenor of 2–3 years and banks lend money to long-term infrastructure projects which have a period of mostly greater than 10 years causing asset-liability mismatch.

9.4.3.2 Pension Funds, Insurance Funds, and Infrastructure Debt Funds

Market now looks to life insurance companies and pension funds which are well capitalized and looking for long-term returns. As per ASSOCHAM, pension fund market in India is about 20 lakh crore with annual CAGR of 10 % which has a potential to be channelized in long-term infrastructure projects (ASSOCHAM 2012). Similar case is for insurance funds where the government is training to raise funds by allowing 49 % FDI in insurance against formerly 26 % which would result in large inflow of money from FII. Infrastructure debt funds also remain a prominent tool to solve the asset-liability mismatch issue of bank financing of infrastructure. Infrastructure debt fund (IDF) has got a good response with leading infrastructure companies and banks entering the business. The government has also given tax exemption to these funds for attracting the investors. For example, Larsen and Toubro infrastructure debt fund is an infrastructure fund in which LIC is a partner leading to raise funds for financing infrastructure project. It also refinances the infrastructure projects setting bank money free so that those money can be pumped back in new infrastructure projects.

9.4.3.3 Bond Market

Bond market offers fixed income opportunities to investors which have potential to prove efficiency in India. The USA and Canada have raised significant capital through bond market which was used for various urban infrastructure projects. These bonds get matured when a certain fix goal which was fixed is achieved by the money raised by bonds. The interest rates for these bonds are higher than the

interest rates by banks. Municipal bond market has also remained underdeveloped in India except few successful cases like Ahmedabad municipal bond which was a first bond by a municipal government which raised 1000 million to implement water- and sewer-related projects in 1998 (IL&FS 2005). The interest rates given were 14 % semiannually, whereas bank interest rate at that time was 13–14 % only[1], resulting in a large number of bond buyers and easy fund-raising. Innovative bonds are there for innovative concepts like smart city and "climate action bond" type of bonds which were issued by the European[1] investment bond to raise funds for projects related to renewable energy and others that concern the climate change. This bond was based on green projects, raising funds for green projects which are usually financial not viable.

9.4.4 Multilateral Financial Institutions

The Government of India also accesses financial assistance in the form of loans/credits/grants from various multilateral agencies. The World Bank and the Asian Development Bank (ADB) are the leading multilateral institutions for availing external assistance by India. The World Bank's new strategy proposes a lending program of $3 billion to $5 billion each year over the next 5 years, with 60 % of this funding going to government-backed projects (Ministry 2015).

9.4.5 Equity Investment

9.4.5.1 Venture Capital

Smart cities are conceptualized as a platform for innovative ideas and start-ups, and venture capital can serve as an important tool for start-ups in smart cities. Smart cities have tremendous opportunities for technology, and digital infrastructure presents a high-risk, high-return opportunity for global venture capital into innovative companies. Multinational corporations along with traditional ventured capital firms are aggressively increasing their investments to drive the smart city industry in the world, e.g., TATA investment in new start-ups like "snap deal" and "blue stone." Venture capital can be "corporate venture capital" or government small-medium enterprise support. In 2015, the budget finance minister declared 1000 crore for start-ups which are high-risk investments (Budget 2015).

[1] https://www.sbi.co.in/portal/web/interest-rates/benchmark-prime-lending-rate-historical-data

9.4.5.2 Alternate Smart City Vehicles

There are various options for investment by overseas investors into India including FDI, foreign venture capital investment, or foreign portfolio investment (FPI). Depending on smart city vehicle nature (i.e., infrastructure, real estate, technology, etc.), investment can be made through different routes like FDI, FPI, etc. "Make in India" allows 100 % FDI inflow in different sectors like renewable energy, construction, etc. which are principal sectors of smart cities.

9.4.5.3 Real Estate Investment Trust

Smart city development requires a significant real estate investment, which is globally structured and regulated differently than infrastructure. Currently, 100 % FDI is allowed in Greenfield property projects. GOI and SEBI have approved rules for the creation of real estate investment trusts (REITs) for fund-raising understanding the appetite of retail investors who want to invest in real estate projects but can't do due to the high cost of investments. REITs will provide a new source of funding for developers as well as dividends for investors and also satisfy the financial requirement of the real estate projects. To encourage REIT development, the government has provided tax pass through status so that large investment can flow in through REIT route.

9.4.6 Financial Models and Tools for Smart Cities

The financing sources of smart cities described above will be accessed to arrange finance in multiple ways. Project financial structuring includes the ways in which funds will be deployed and will depend on models used and tools to support these models. The following are the potential financial structuring approaches for smart cities.

9.4.6.1 Debt Equity-Based Leveraged Structure

Debt and equity form the capital structure in project financing. Leverage of project is driven by the proportion of debt and equity in capital structure. This structure is the most significant model of project financing. Typically, the debt part comes from banks. Equity is an ownership right that can be claimed by the private player, public, or combination of promoters. Equity consists of shareholder agreement between different shareholders. Debt-to-equity ratio depends on the type of project and risks involved in the project. A higher-risk project will have lower debt-to-equity ratio and vice versa. Such leveraged structure may not be the most efficient vehicle for smart city financing as the ability to correctly forecast and model cash flows in such cases is highly constrained on the account of the lack of experiential data and case studies.

9.4.6.2 PPP

Smart city following PPP structure in infrastructure benefits because of the formal alignment of government and industry capacities, technology, assets, and capital. PPP which is also known by the name of project finance initiative has witnessed a mixed rate of success in the past. Recent economic survey of the Government of India (Subhramanyam 2015) said that PPP models have to be restructured as a lot of them are struck. The failure of a PPP is often due to the lack of realistic objective, financial management, project governance, and equity in the risk management level of risk equitably shared between the parties, e.g., the Delhi Metro Airport Line where interests of private player and the government were not aligned and led to failure to achieve the deadline of project (i.e., commonwealth games) and eventually resulting in the suspension of services for 6 months. The nature of the concession agreement between the government and developer is another key area to PPP success. Proper framing of concession agreement based on the risk of project, type of project, etc. can prove to improve PPP success ratio. Forming a proper PPP model which satisfies the interest of private party and the government can be a key to raise large funds.

9.4.6.3 Tax Tool

Favorable tax treatment for global companies is an important tool and has the potential to be an extremely effective policy tool for encouraging urban development beneficial to all citizens. For example, the policy support for clean energy can make clean energy projects more viable for private players to invest. Moreover, tax increment financing (TIF) is a funding instrument that may be used to develop smart cities. Funds raised from taxes are used to develop infrastructure, clean energy projects, and revive properties back to productive use. Proper collection of tax can help municipalities to raise good amount of fund which they can pump back in the system for operation and maintenance.

9.4.6.4 Innovative Business Model

Traditionally public sector has worked with business on city projects with conventional methods. This approach could prove to be insufficient for smart city projects. Innovative businesses are tools to help the financial model success. The innovative models include “cloud city services,” “crowd financing,” “payment enabler,” etc.

9.4.7 World Smart City Financial Model Cases

As mentioned previously, the lack of studies on smart cities in India, partly due to being a new concept, compels us to identify and review sources and models of financing smart cities in global setting. Table 9.5 shows the application of different tools, models, and sources of finance used worldwide.

Table 9.5 Cases of worldwide use of different sources

Tools/model/source	Case	Description
Debt		
Banks	Smart development: Belgium	The European Investment Bank (EIB) and Belgium Bank raised € 400 million for the project
Bond	World Bank: green bond. Rio de Janeiro's urban rail transport	The World Bank Group has raised $6.7 billion in green bonds which enjoys AAA rating. These would be used for low-carbon projects. Smart city projects satisfying low-carbon criteria get this funds (Worldbank 2009)
Infrastructure debt fund	L&T IDF financed PPP project of NH7 Nagpur-Hyderabad	L&T IDF is a fund raised by L&T and LIC to finance the infrastructure projects that require funds to get viable and give banks to release fresh funds for projects
PPP	Rio de Janeiro: Brazil. PPP for developing city for Olympics	35 % of investment was by private party. IBM was a partner for center of operation. Also, Olympic Park was built by private money
Equity		
Real estate	Dublin raised € 300 million through REIT	First green REIT raised € 300 million and second REIT raised € 365 million from investors which were used for real estate in Dublin smart city
Venture capital	Siemens sponsored Sunverge	Sunverge is a California-based company started in 2009 with vision of integrated solar storage with smart controls. Sunverge investors include Southern Cross Venture Partners and Siemens Venture Capital (Siemens 2009)
FDI	Amsterdam smart city	According to the research of PWC, Amsterdam achieves significantly in attracting FDI. It attracted about 95 projects of investment through FDI by providing proper policy frame
Tax	Seattle, Washington	Tax breaks are given to business in green technology and also to the residents who keep their property green

(continued)

Table 9.5 (continued)

Tools/model/source	Case	Description
Innovative models		
Cloud-based services	CISCO cloud service Chicago	CISCO and a wide range of stakeholders public and private in the city of Chicago are advancing a series of Smart + Connected Community initiatives
Payment enabler	MasterCard Long Island cashless service	Long Island urban mobility is a cashless service provided by MasterCard where the entire ticket payment of modes of transport was done by e-ticketing by MasterCard
Crowd financing	Denver city: the USA	Denver raised $12 million in just one hour it needed. It was oversubscribed and the authority had to give back 375 orders. Unlike mini-bonds, which often sell for $20,000 or more each, Denver's mini-bonds were just $500, and investors couldn't buy more than $20,000

Source: Author's compiled from various sources

9.4.8 Strength and Weakness of Each Source

The strength and weakness of every source need to be understood to understand its suitability under different risk conditions and thereafter the type of infrastructure it suits. Table 9.6 shows strength and weakness of each source.

9.4.9 Financial Analysis Summary

As discussed earlier, the source of finance depends on the risk nature of the particular infrastructure. After understanding the strength and weakness of each source, it was possible to broadly list the type of source based on the infrastructure type. This finding can serve as an initial push to the policy of smart cities. Based on the type of the city and type of risk in the infrastructure, the findings can help to identify the best source of finance. Table 9.7 shows major infrastructure of the city and their best suitable mode of finance based on the financial study done.

Table 9.6 Strength and weakness of sources

Type of finance	Strength	Weakness
Debt		
Banks	Healthy completion among banks	Debt given is governed by interest rates causing uncertainties, high NPA, asset-liability mismatch
	Good liquidity	
Bond	Definite yield, easy fund-raising	Rating sensitive, not easily tradable in the secondary market
	International fund-raising	
	Guarantee by IIFCL and RBI derivative CDS	
Infrastructure debt fund, pension and insurance funds	Long-term funds hence suit infrastructure projects, huge cash piles, interest in diversification, feeder funds, refinancing	Highly governed by policy causing uncertainty. IDF-NBFC decides the projects to invest
Equity		
REITS and InvIT	Satisfies hunger of real estate investment, direct public participation in infrastructure projects; success rate is high globally	Depends on project mix of particular funds, still in draft stage; system needs to be updated
Venture capital	Finances high-risk projects	Mostly suits for small investments only, owner and VC conflict of interest
	Start-ups	
	Innovative projects	
FII, FDI	Enabling provision by rupee bonds	Swings in the market, potential threat for national importance sectors, policy sensitive
Multilateral finance/ bilateral finance	Gives grants, helps in capacity building	Western dominance

Source: Author's compiled from various sources

Table 9.7 Financial modes and best sources to finance

Particulars	Finance modes	Case
Real estate	REIT	Dublin raised € 300 million through REIT
	FII	Amsterdam attracted about 95 projects of investment through FDI by providing proper policy frame
Physical amenities (SWM, water supply, sanitation)	Bonds	Ahmedabad municipal bond raised 1000 crore for water supply and sewer projects
	Infrastructure investment trust	NA
Smart	Multilateral financial institution, PPP	OECF Japan gave 56 % of the total fund requirement in Delhi Metro
Mass rapid transit systems		L&T Hyderabad metro project
Start-ups/new ideas (e.g., ICT business)	Ventured capital, crowd financing	Siemens sponsored Sunverge
		Denver city: the USA raised $12 million in just one hour it needed

(continued)

Table 9.7 (continued)

Particulars	Finance modes	Case
Roads, electricity, public spaces	Bonds, IDF, InvIT, PPP	L&T infrastructure debt fund financed PPP project of NH7 Nagpur-Hyderabad. L&T IDF has LIC as lead promoter
Education, health care, and Hospitality	PPP, PE, banks	The UK has 130 PPP projects in health care (e.g., St. Bartholomew and London Royal). 5 star Shilparamam hotel, Hyderabad. Model schools PPP
Smart grids	Multilaterals	World Bank finance smart grid Vietnam
	PPP	FINSENY project EU
Cloud-based computing	ICT companies	CISCO cloud service Chicago
Payment enabling	Payment enabler company	MasterCard Long Island cashless service

Source: Author's compiled from various sources

9.5 Summary and Conclusion of the Research

Smart cities are widely considered to be the new form of cities that allow for sustainable investment and consumption. Such cities are viewed as a new engine of growth, characterized by resource efficiency, economic effectiveness, environmental improvements, and other value-enhancing aspects. A close and careful look at the timeline-based evolution of smart cities worldwide points out that the need for such smart growth engines has arisen on the account of different antecedents and reasons in different countries and circumstances. This variance appears to exist because of the possible versatility of attributes that define and make up smart cities. Extant research studies acknowledge this and fail to provide a homogeneously unifying definition of smart city. The conceptualization and definition of smart city is structured around different names, different circumstances, and different policy outcomes in different countries.

Definition is the building block of city planning as it lays out a broad contour of development of smart cities. Arriving at a definition that works well in a specific context, therefore, is indispensable to further the development of smart cities. India is yet to articulate a clear definition of smart cities, although a concept note on developing 100 smart cities is already in place. Using the concept note to understand dimensions of smart cities in India in relation to an exhaustive definition of smart cities worldwide shows that India's definition of smart cities is more holistic and inclusive rather than focusing overbearingly on technology alone. Overall concept note by the Government of India talks in broader sense rather than having a technology-stressed approach.

Furthermore, the comparative analysis of the concept note with other smart cities worldwide, in the context of India's socioeconomic landscape and political economy, suggests that focus should be directed toward adopting a city-centric approach to developing smart cities instead of a centralized national approach. A city-centric approach offers flexibility of setting in the plan around local socioeconomic-

behavioral contextual specificities which simply cannot be completely captured by a single national approach. Authority and power should be bestowed upon states to come up with their own smart plans, and then center should select from those cities based on some completion parameters.

This recommendation, however, poses governance challenge which needs to be recognized and accounted for at the time of prescribing such policies. India is a federal democracy where the power of constitution and legislation is divided between states and center. Also the administration of different sectors like transport, power, urban development, etc., is governed by different ministries and departments of government. Many infrastructure projects have been halted due to regulatory and permission delays by other departments. For example, railway overbridge construction projects get delayed due to the dispute between railway and road department. Purely from governance viewpoint, a series of reform need to be initiated to push policy impetus on improving interdepartmental and intergovernmental cohesiveness and collaborative operating efficiencies. This is a precondition for developing smart cities in India.

Developing 100 smart cities in India necessitates copious financial requirements. Given our recommendation of a city-centric approach, it is not too difficult to see that the capacity of states and cities will be quite constrained when it comes to raise finances for smart city development. Therefore, innovative economic and financial structuring needs to be employed to augment the smart developmental process. Various sources of finance have been identified and compared in order to understand their characteristics, more specifically their strengths and weaknesses in the context of assets need to be funded. A broad analysis is conducted to understand what works best for what kind of infrastructure in smart city parlance. The finding can serve as stepping stone to understanding what type of initial policy push is required to facilitate financing of smart cities. It can help policymakers to identify the potential financing sources based on the type of the city and type of risk in its infrastructure.

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