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Smart Funding Options for Developing Smart Cities: A Proposal for India

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Abstract

With the advent of proposed Smart Cities for the issues like limited resource, population growth and climatic changes which will help India achieving the holistic development of the economy by achieving economic feasibility and sustainable growth through integration of design and technology. The proposed structure will help the Indian Economy to provide long term funding and employment opportunities in future. The rapid urbanization of Indian Economy will put immense pressure on the different facets of life such as infrastructure, managing finances, and quality of life which will lead to evolution of smart concepts and models. The proposed structure for smart cities will address four fundamental areas as organizational, infrastructure, social and economic aspects. The Government of India has allocated 70.6 billion (USD 1.2 billion) for Smart Cities in Budget 2014-15 for developing 100 smart cities over a period of 5 years. The Smart City Mission will be operated as a Centrally Sponsored Scheme (CSS) and the Central Government proposes to give financial support to the Mission to the extent of Rs. 48,000 crores over five years i.e. on an average Rs. 100 crores per city per year. An equal amount, on a matching basis, will have to be contributed by the State/ULB; therefore, nearly Rupees one lakh crores of Government/ULB funds will be available for Smart Cities development. The paper proposes the various sources of funding available in the world economy and their feasibility considering the Indian Economy which can be adopted for generation of required funds. The paper focuses on evaluating the various funding options and their feasibility with reference to Indian perspective.

Keywords: Financial Innovation, Raising Funds, Smart Cities, Sustainable Development, Technology Innovations

1. Introduction

Some of the seeds of today's metaphor for urban modernity; "Smart Cities" originated in the U.S. information technology company IBM when The CEO Sam Palmisano put forward this concept of smart earth (Li et al., 2014)

The concept of smart cities is to use digital technology to make a city more efficient and sustainable. The term encompasses a vision of an urban space that is ecologically friendly, technologically integrated and meticulously planned, with a particular reliance on the use of information technology to improve efficiency.

Given the pace of Urbanization, it is predicted that nearly 70% of the world populations will be living in the cities by 2050 and India is no exception. Currently 31% of the Indian population stays in the cities and contributes about 65% to the national GDP (World Bank data). The increase in Urbanization will exert immense pressure on the existing infrastructure, food supplies, water supplies, traffic management, waste disposal systems, sustainability and on the overall quality of life. There has to be a simultaneous development in the technological frontier of the cities in order to accommodate the agglomerations. Hence it is imperative for the government to introduce technology and build smarter solutions to solve these problems.

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A smart city is a practical solution to cope with this unprecedented urbanization.

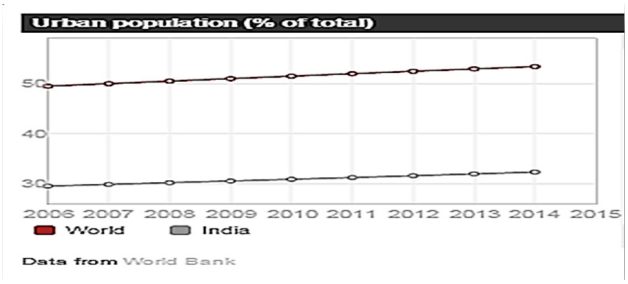

Figure 1. Urban Population Data from World Bank.

According to Frost and Sullivan (2003) smart cities include smart Governance and smart education, smart healthcare, smart building, smart mobility, smart infrastructure, smart technology, smart energy and smart citizen.

The concept of smart cities in India, under the vision of the prime minister is a little broader. The smart cities in India are expected to attract investments, building cities that work well especially for businesses and developing new technologies for communication and dissemination.

According to the planning commission 12th five year plan, the smart cities would be engines of growth as they would increasingly compete for investments nationally and internationally too. Therefore, cities must provide world class infrastructure and services at affordable costs to give a competitive edge to the economic activities they host. Besides, cities should be able to provide basic services to migrant workers, their families and other vulnerable sections of society including women and children.

Figure 2. Smart cities guidelines.

According to Guidelines issued by Ministry of Urban development the strategic components in building a smart city would be-

- City improvement (Retrofitting)
- City Renewal (Redevelopment)
- City extension (greenfield development)
- Pan City

Retrofitting envisions altering the existing build up area in a smart way such that it becomes more efficient and livable. This will include improving the existing infrastructure and services to achieve the smart city objective.

The existing build up infrastructure would be demolished to build entirely new structures in *Redevelopment*. New layouts would be prepared with higher floor space index, high ground coverage and mixed land use.

Greenfield introduces smart solutions in vacant areas. Using innovative planning, plan financing, plan implementation tools. The focus of greenfield would be on providing affordable housing especially for the poor.

Pan City envisages application of select smart city solutions to the existing city wide infrastructure by integrating design, technology, IT and data. Better data would mean better decisions. This data willalso serve as reference to the other cities of India which have not been included in the 98 smart cities of India.

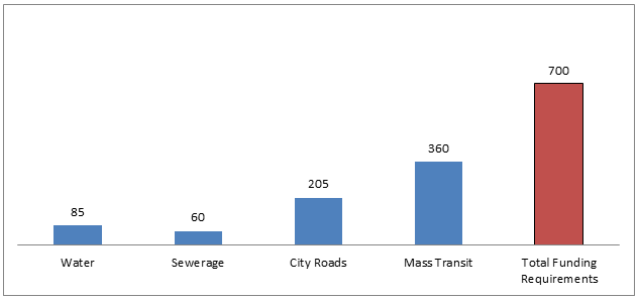

Figure 3. Funding Requirements.

As per the Reference Note (No.28 /RN/Ref./ November/2014, 2014), where The High Power Expert Committee (HPEC) on Investment Estimates in Urban Infrastructure has calculated a Per Capita Investment Cost (PCIC) of Rs. 43,386 p.a. for a Twenty years for building 98 smart cities. Considering the low budget, it is clear that the government will have to collect most of the real financial support from PPP sources. It is

estimated that INR 7 Lac Crores would be required for next 20 years for the development of these smart cities. The below mentioned chart explains the funds required for various smart utilities. Apart from these basic utilities funds would also be required for developing Affordable housing, 24x7 electricity, ICT services, education, cost-efficient health services, recreation and sports facilities, etc. have not been estimated / considered by the MoUD in the below figure.

The following paper looks at the available funding options for building smart cities in India. This paper proposes various smart funding options and analyses their feasibility in India. Most of these options proposed are prevalent in the current economic environment while some could be tested and implemented considering the regulatory framework of India.

2. Existing Models of Smart Solutions in India

Considering the financial requirement, technical facility and technological up gradation required for developing the smart cities in India, some instances of smart solutions can be viewed where existing infrastructure has been leveraging.

- A Smart public transport system Bus Route Transit System (BRTS) is operational in Ahmedabad, Gujarat which is operated by Jan Marg Limited.
  The BRTS covers one third of the city of Ahmedabad with 12 bus routes and 126 bus stops providing a number of smart solutions such as Bus Tracking System, Fleet Management, Automatic Ticketing and Passenger information. Approximately INR500 crores was utilized for development of this project in phase 1.
- Water management system SCADA was implemented in Pimpri and Chinchwad providing water solutions with an investment of INR 13 crores. The real time auditing, control and monitoring of 450 ML/ day water supply to an area of 171 sq. kms. The reporting system provides the data pertaining the water flow, pressure, level and insights on day to day issues.

3. Literature Review

For understanding of the need for the occupants the smart city there is a need to study the movement of objects in a smart city where by mining of data from the floating sensors, mobile devices, smart cards, vehicles is studies which gives a fair idea from trace data to knowledge and then to the applications and utilities and their levels needed (Gang Pan et al., 2013). There are schemas for management of this data by proposed frameworks which are introduced in planning stages and are efficient (Sahoo et al., 2014).

To build smart cities there are utilities using smart technology that is needed to translate the data that is captured to intelligence and then knowledge. Not just stopping at the knowing something an action has to be taken where intelligence comes into play and steps like actuation, where action is taken with monitoring and controlling that action to give the desired results (Wan and Alagar, 2014). More intelligent utilities under city management especially the public utilities and services in smart cities needs a massive and intricate multi-dimensional calculations and its analysis, leading to data mining on cloud computing platforms. A smart city's representative characteristics are that smart cities are superior for offering digital securities systems and intelligent services. (LI, Shan et al., 2013)

For wealth building we have to understand the value that is at stake and thus we also need to observe the social value that is constructed. The governance will ensure that the system has process and control on the business model that is built around the smart city from the components of utilities that have to integrate to create this value. These will be an aggregation of almost all services, especially the technology or digital services (Walravens and Ballon, 2013)

A smart city relies, among others, on a collection of smart computing technologies applied to critical infrastructure components and services. Smart computing refers to a "new generation of integrated hardware, software, and network technologies that provide IT systems with real-time awareness of the real world and advanced analytics to help people make more intelligent decisions about alternatives and actions that will optimize business processes and business balance sheet results" (Washburn, D. et al., 2010)

The existing funding options primarily used by government and entrepreneurs mainly comprises of the PPP which is defined as "the transfer to the private sector of investment projects that traditionally have been executed or financed by the public sector" (IMF, 2004), Bank financing, Capital and Money market instruments

etc.

Debt and equity are not merely alternative modes of finance, but are also alternative modes of governance (Williamson 2002). Corporate governance is meant to create some rules and regulations which would ensure that external investors and creditors in a firm can get their money back and would not simply be expropriated by those who are managing the firm (Shleifer and Vishny 1997).

The study by Mayer (1990) observed that two-thirds on the average of investment financing in developed countries like the US, UK, Japan, Germany, France, Italy, Canada and Finland are mobilized through internal financing. Considering India, which is still a developing nation, most of the funding could be done by mobilizing the saving of the households in the form of investment in infrastructure and other smart solutions.

Further for funding of these 98 smart cities government in collaboration with educationists and corporates could develop new financial products which could cater the need. According to John Finnerty (1988), "Financial engineering involves the designing, the development and implementation of innovative financial instruments and processes, and formulation of creative solutions to problems in finance".

The development of new financial services will help government and the investors to pool their investment for good returns.

4. Sources of Finance

4.1 Funding options for India

The high focus of Indian Government on developing smart cities will lead to rapid urbanization and will highlight multiple challenges which are likely to affect the deployment of resources. Following are the issues and potential challenges which may come across while generating suitable financing options in India.

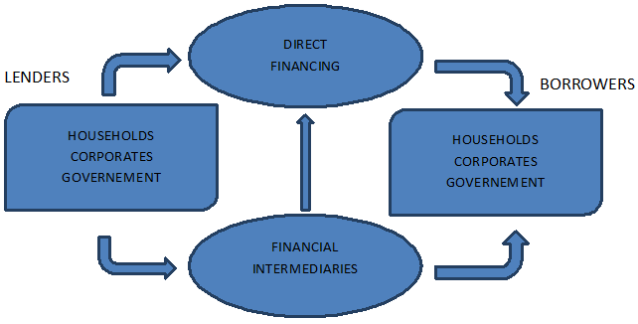

Figure 4. Mobility of funds.

4.2 Financial Support from Government

4.2.1 Central Grants

Smart City Mission will be operated as a Centrally Sponsored Scheme (CSS) and the Central Government proposes to give financial support to the Mission to the extent of Rs. 48,000 crores over five years i.e. on an average Rs. 100 crore per city per year. An equal amount, on a matching basis, will have to be contributed by the State/ULB; therefore, nearly Rupees one lakh crore of Government/ULB funds will be available for Smart Cities development.

4.2.2 Subsidies

Subsidies or grants are funds generally issued by government which are non-repayable in nature. It generally helps the project to boost up as these projects have a huge capital requirement initially. Currently India spends 0.70% of GDP in Urban Infrastructure as compared to 2.5% by China. India spends 1.25% on subsidies in petroleum and fertilizers. An increase in the proposed budget would help transferring funds for development of Smart Cities.

4.2.3 National Investment and Infrastructure Funds

National Investment and Infrastructure Fund (NIIF) is a fund created by the Government of India for enhancing infrastructure financing in the country. Smart cities could be funded by mobilizing these funds for infrastructure development. The initial authorized corpus of NIIF would be Rs. 20,000 crores, which may be raised from time to time, as decided by Ministry of Finance.

4.3 Existing Financial Infrastructure in India

4.3.1 Direct Financing

With the issue of shares or other long term source of finance Government/ Companies can generate direct funds from the investor by selling securities for cash. It is method of generating funds directly from the financial market without using the services of financial intermediaries. The money accumulated will be then routed for investment in development of smart projects for smart cities.

4.3.2 Financial Intermediaries

Another option for those entities that are not able to raise funds through organized exchange markets is the indirect financing i.e. raising money through financial intermediaries such as Banks, Venture Capitalists, and insurance companies etc. who act as a facilitator. Considering the need for Smart Technology and its vast usage will ensure availability of funds from financial intermediaries.

According to the June 2015 Financial Stability Report (FSR) of the Reserve Bank of India, infrastructure, which constituted 15 per cent of total advances of the scheduled commercial banks, had a much larger share of around 30 per cent in total stressed advances.

4.3.3 Municipal Bonds

Permission must be given to all ULB's to raise funds by issue of Municipal Bonds. Currently the permission are project based and on adhoc basis. Tax free municipal bonds will provide huge financial support through which ULB's with poor financial health can raise funds and mitigate the risk among participating ULB's.

For developing smart cities the credit worthiness of the cities could be analyzed and bond readiness could be checked.

Various instruments are issued by company's acknowledging the money borrowed containing the terms and conditions of the loan, payment of interest and redemption of the loan, the security offered (if any) by the company.

4.3.4 Equity Market Instruments

Equity share capital represents the primary source of finance for acquisition of funds by issue of common shares to the investors for a return in the form of dividends as well as capital gains. It is a form of financial asset which represents the ownership of the company. Since there is no maturity it's a permanent source of fund and does not involve any mandatory payment to shareholders.

The risk return trade off can be carefully blended which gives maximum return with minimum risk means achieving and maintaining the risk and return of the project which gives potential returns to the investors.

4.3.5 Mezzanine Financing

It is a form of subordinate debt sometimes called second tier debt. It is an unsecured debt, where the lender (usually investor) also receives some rights to acquire equity. It is an attractive way to borrow funds beyond the amount that secured lenders will loan. Generally the rate of interest is higher than that charged on senior debts. Also the term of the loan is less. Mezzanine financing is generally supplied by venture capitalists, Commercial banks, Insurance companies etc. The instrument will be a smart option to cover subordinate debt, collateralized debt obligation, viability gap instrument etc.

4.3.6 Real Estate Investment Trust (REITS)

REITs, a new investment avenue in India on the lines of one in developed markets like the US, UK, Japan, Hong Kong and Singapore, can be listed and trading would be allowed in units of REITs like any other security on stock exchanges which could help the debt ridden real estate companies to get liquidity. It is a type of financial instrument which does the investment in real estate through property or mortgage and traded in major exchanges like other instruments. It is a highly liquid instrument with promising dividend yields and tax concessions. After the approval from Government of India and SEBI for creation of REITs will provide new source of funding for real estate developers and dividends to investors.

In the new rules, at least 80% of the value of the REIT's assets must be in properties that are completed and generating revenue, and may invest only 10% of the value of its assets in properties that are under construction. To drive some of the estimated $20 billion anticipated REITs market toward Smart Cities, policymakers may consider raising this limit for projects under construction.

4.4 Land Monetization and user Charges

4.4.1 Greenfield Smart Cities

Sale of Land for commercial and residential purposes in the proposed smart cities will help the government to recover large part of their initial investment in developing smart cities. A huge capital investment will be required at the initial stages as the cost of this capital expenditure would cost the exchequer a huge amount.

Significant funding would be required as development has to be done from scratch for all the utilities such as water, waste, power etc. For the above mentioned requirements funds could be generated by sale residential/ Commercial etc.

- **Floor Area Ratio (FAR)**: A common phenomenon used for measuring the density of a site being developed. Higher FAR values yield higher returns on land values. It has been criticized that the FAR destroys the skylines multi story building space but on the contrary it is also justifies the protection of residential environments.
- **BOOT** (Build Own Operate Transfer.): Another alternative of public private partnership where in the developer usually a private entity gets permission for developing the project at a concessional rate and operates it till initial cost is recovered.
- **DBFOT Model**: Design Built finance own Transfer model for developing smart cities.

4.4.2 Existing Cities (Brownfield)

Here the funding Charges can be levied for services provided since the scope of developing of new space is limited. The service provider in this can could be either Government or a corporate entity that can transfer the expenditure to the users of the services such as telecommunication, transportation, electricity, Internet etc.

4.4.3 Cross Subsidization and User Charges

A technique of charging higher prices from one party in order to subsidize lower prices for another. Services can be designed in phased manner so that cost recovery can be enabled by this model. User fees allow cities to impose fees to cover the cost associated with funding supporting infrastructure. Under this system, the public jurisdiction shoulders the costs of service/infrastructure investment and dedicates the fee stream from private users for repayment.

4.4.4 Scalable Models

The cities that are now in the making become the preparation for newer projects, where the scalability of the building of smart cities, becomes evident for the areas that need more focus to develop. The need to ensure we build better cities becomes necessary due to the fact that approximately 31% of the population in the cities is the source of 60% of India's GDP. It is projected that about 75% of GDP will come from urbanized part of the country. (Planning Commission Report on Urban Development). For ensuring that it has sustainable financial tenacity, transaction based recovery of cost in phased manner for services such as telecommunication, postal services, electricity tariffs etc.

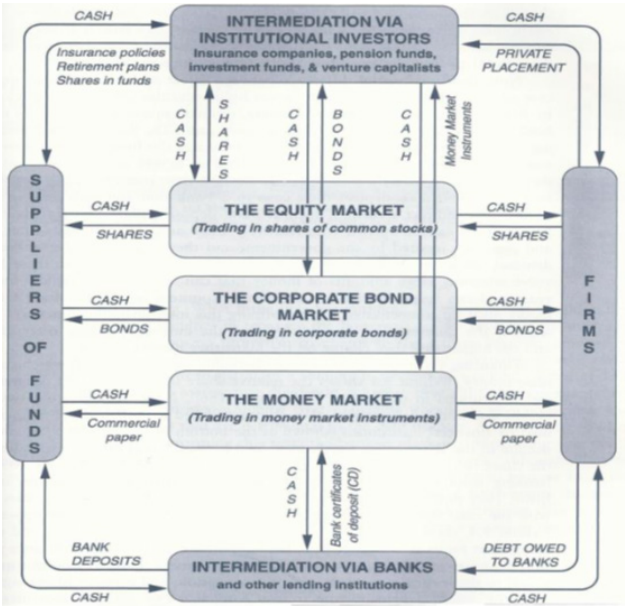

Figure 5. Financial System.
Source: Hawawini, G. and Viallet, C. (2007)[6]

- Tap Fees can be levied to cover the cost of tying water meters for new connections to existing lines. Several States in US such as Michigan and Colorado charge fees for installing water meters, which are usually over and above normal water usage charges based on consumption.

4.5 International Modes of Finance

4.5.1 New Development Bank

The NDB floated by the BRICKS Nations has formally started financing infrastructure investment and sustainable development projects at its headquarters in Shanghai. The NDB will be supporting the international financial system. The NDB will have an initial capital of $50 billion, which will be expanded to $100 billion within the next couple of years.

The Asian Infrastructure Investment Bank (AIIB) is in process of getting functional with support from China worth $50 Billion. India and 56 other nations have joined the AIIB.

4.5.2 Bilateral and Multilateral Agencies

The India government is can coordinate with the World Bank and the Asian Development Bank for providing grants to support the ambitious five year Smart Cities Plan. Other funding agencies such as China-led Asian Investment Infrastructure Bank, Japan International Cooperation Agency (JICA), Agence Française de Développement (AFD) and Germany's GIZ and KfW Development Bank could also be other options for sending proposals for procurement of funds.

The World Bank Group is already supporting India's rural sanitation mission through ongoing projects worth $1.1 billion. These include a $500 million rural water and sanitation project that is funding sanitation investments in low-income states, including Assam, Bihar, Jharkhand, and Uttar Pradesh.

4.5.3 Foreign Direct Investment and Foreign Institutional Investment (FDI and FII)

Private entities will play a major role by financing the Smart Cities which will ensure new revenue streams and capitalization on digital platform. Educational institutions and Business Conglomerates will be the first to bank maximum revenues by providing infrastructure and technology solutions. So the far the FDI policies are not in favor of investors resulting in poor structure of PPP model. Although, FDI in real estate has been relaxed in terms of built-up area and capital requirements, which might further encourage smaller investors to participate.

In the January-June period, India has surpassed US and China as the biggest Foreign Direct Investment (FDI) destination, garnering $31 billion investments compared with $28 billion attracted by China and $27 billion by the US. (DIPP report)

5. Financial Innovation for Smart Funding

5.1 Crowd Funding

Crowd funding is basically a methods where the people contribute voluntarily small amounts to a cause. The basic reason normally are to either connect to a great cause of the campaign or expect some great aspect like reward from the campaign or connect to some exhibit from the campaign as the outcome. For smart cities the crowd sourcing for funds by contributing to the cause of building of the smart cities. Under the planning for the smart cities it is up to the planning commission to set the limits and norms for this method. There is also the issue of the different period where the crowd sourcing that will be needed for sustainable development. The people who contribute to the cause must entail some benefits for the future and hence it cannot be unaccounted. There are several crowd sourcing platforms and government norms setting a ceiling limit to the sourcing for the same.

Example: Chicago City, where local community members are participating in the implementation of renewable energy projects through community based crowd funding model.

5.2 Nirbhaya Fund (Indian perspective)

Nirbhaya fund was created with a view to ensure empowerment, security and safety of women and girl children in India. A corpus of 10 Billion Indian rupees has been earmarked by the Government of Indian in the Union Budget 2013.

The funds allocated under this head can be utilized for development of Smart cities with a view to enhance safety and security of women. Safety in public transport systems, CCTV cameras for Smart Cities to reduce Crime and other security measure in terms of Information technology, Road transportation and highways and railways etc.

5.3 Monetizing the Data

Smart cities will generate enormous amount of data by instrumented systems. The data could be provided for commercial use to other service providers who can further extract useful information from the same. State Government could mobilize the then generated resources for funding smart infrastructure and other utilities. The Internet of Things is set to be a $3 trillion opportunity in the market. With increased connected devices, there will be huge accumulation of data, which the companies must convert to value and then effectively use it as part of their revenue model. A SAP study estimates that the worldwide market for selling data generated from mobile phone user behaviour may reach $9.6 bn by 2016.

5.4 Smart Bonds

A special purpose vehicle which provides economic returns to all the stakeholder of the investment by achieving a specific goal such as development of smart cities or providing smart services to the masses, infrastructure

development or increase in efficiency. Some common examples of Smart Bonds are Green Bonds, Social Impact Bonds, and Infrastructure Bonds etc.

A fixed income security issued to raise funds for a project which contributed to ecofriendly, low carbon, and carbon resilient economy. Funds could be mobilized from government in the form of direct funding or from institutional investors to climate change mitigation.

5.5 Carbon Offset

Funds could be generated by issuing the bonds (Usually Government or Private Players maintaining the project) to the investors or corporates. The carbon offset is a financial instrument which represents the reduction of Carbon Dioxide equivalent from the atmosphere from an emission reduction projects taken up by government, corporates.

The World Bank has issued US $8.5 billion in green bonds in 18 currencies, including a 10-year US $600 million benchmark green bond and green growth bonds linked to an equity index and designed for retail investors. The proceeds are later utilized for supporting renewable energy, energy efficiency, sustainable transportation and other low-carbon projects.

The Multi-National Companies and Indian Corporate Giants could lead the road ahead by issuing green bonds.

5.6 Tax Increment Financing

A public financing method used for generating funds in the form of subsidy for redevelopment, infrastructure and development projects for the community. This option could be exploited by the India government for generation of funds. Funding for the smart cities could also be done by implementing the TIF, commonly used as a subsidy for redevelopment, infrastructure and other community development projects. Revenues from increases in property tax are escrowed for a defined period of time to finance new infra investments in this area. This would also enhance accountability by linking expenditure with outcomes relevant to local residents.

For example in Chicago 105 of all property tax are earmarked for TIF purpose.

5.7 Energy Saving Performance Contracts and Other Taxes

Indian corporate entities could adopt the example of Houston where Schneider Electric leveraged this proposition to perform energy efficiency retrofits in 40 municipal buildings. By building smart project which are ecofriendly and energy efficient in nature the cities could decrease the emission rate and boost its sustainability by savings in energy, fuel and water costs.

Different forms of taxes could be imposed to leverage funds for smart city initiatives. However, they need to be explored further to understand their potential benefit / impact.

- Green tax on fuel purchase
- Urban tax on purchase of new vehicles
- Betterment charges payable on sale / registration of property

Figure 6. Participant of Smart City.

Source: Frost and Sullivan

6. Revenue Models

The development of smart cities across India will lead to development of various business models. Gradually the revenue stream will be generated from the products or services offered.

The advancement of technology coupled with companies providing smarter solution to end users is shaping the market towards competition and coalition. The level of flexibility and scalability will lead to innovation and provide ample opportunities for businesses to build infrastructure and provide services.

Market participants may evolve following business models in such engagements.

- Integrators (the end-to-end service provider);
- Network Service Providers (the M2M and connectivity providers);
- Product Vendors (hardware and asset providers);
- Service Providers (third-party management / operation / services of smart products).

6.1 Cloud based Services

Smart City Solutions as Service (SaaS) are changing the traditional business models. CISCO, IBM, Accenture are some of the private sectors companies are creating cloud based services such as Smart Parking, Smart Building, Traffic management and Health Care. The Cisco Smart City designed for Cisco employees to work, play and learn, the Cisco Smart City is a spectacular showcase of how a pervasive physical network infrastructure can easily connect to devices (such as sensors, information access points and mobile devices) with a high degree of security.

Another example is the cloud based infrastructure delivered by Local Government with CISCO and Korean Telecom (KT) sharing both cost and risk of the project. The Public Private Partnership (PPP Model) has not only generated USD 2.2 million as revenue but also drives new jobs in the city.

6.2 Monetizing Revenue from Data

Data monetization could be the next big revenue model which the Government and private sector companies could tap for generating stream of revenues. Denmark for example has estimated the revenues generated from reuse of public data could be as much as 80 million Euros per year while the social benefit of this amounts to 14 million Euros.

The statistics of IBM Big Data Flood Info graphic shows that 2.7 Zettabytes of data exist in digital universe today and 100 Terabytes of data are updated daily through Facebook and other social networks resulting into 35 Zettabytes of data generated annually by 2020 (Elena, 2012)

The big data technology would serve as a revenue model and could be a gateway to monetizing data. Smart city strategies may lie upon big data which for example could help in eliminating traffic congestions through predictive analysis of transport system etc.

7. Analysis of Sources of Finance

7.1 Implementation Issue and Probable Solutions

As we discussed the various possible financial instruments which could be used to mobilize of funds from Households/ Investors/Corporates and can be routed to developing smart cities, possible issue with respect to regulatory framework and use of these instruments in Indian financial markets have been discussed below.

Table 1. Resolving Issues

Key Issue	Solutions
New Smart Cities will require huge financial investments	Sale of Land and Suitable pooling options can be used.
For conversion of existing cities into smart cities	Services can be rendered and revenue can be generated in a phased manner. Focus can be made upon leveraging technology solutions for delivery of services.
Real Estate Investment Trust (REITS)	Mandatory Listing, Only public issue, Rs. 5 Billion assets at the time of IPO.
Foreign Direct Investments	Indian companies can issue capital against FDI.
FII/FPI	Limits of Individual holdings below 10% and aggregate limit of 24%.
FCCBs	Bonds issued by Indian companies expressed in foreign currency.
Crowd funding	Company can raise not more than Rs. 10 Crore from equity based crowd funding.
Carbon Credits	Forward market Commission has granted trading of carbon credits in Multi Commodity Exchange

7.2 Overview of Risk in Smart Cities

Risk is a concept involving negative impact to value that may arise from a future event, Any definition of risk is likely to carry an element of subjectivity, depending upon the nature of the risk and to what it is applied. As such there is no all-encompassing definition of risk. Chicken and Posner (1998) acknowledge this, and instead provide their interpretation of what a risk constituents:

Risk = Hazard x Exposure

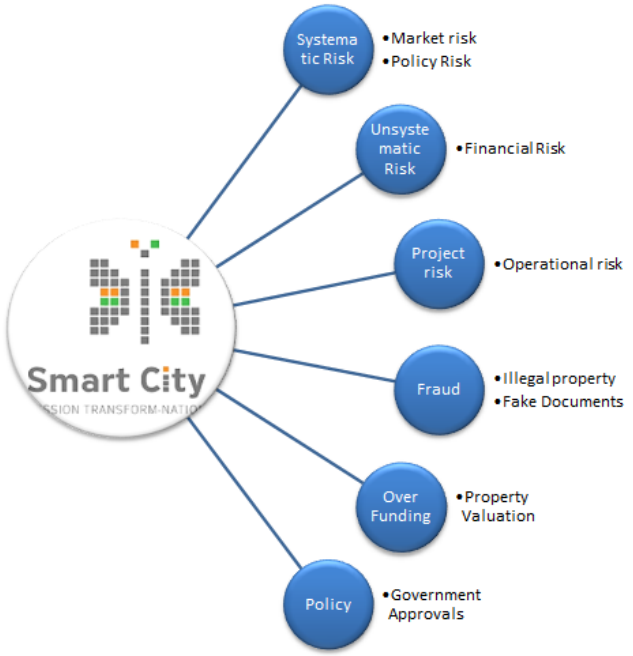

Figure 7. Multiple Cause Diagram of Risk in Smart Cities.

Risk is also considered as an uncertain event that can lead to certain losses in future. An event to the consequences of uncertainty constitutes a risk. In everyday usage, risk is often used synonymously with the probability of a known loss.

Government vision on this project of Smart cities is a proposition where it is unclear on the share of central and state government of the funding. The earlier plans for creating smarter cities in the programs as AMRIT (Atal Mission for Rejuvenation and Urban Transformation) covering about 500 cities did not take off as planned in spite of complete government support. The learning from the countless plans drawn world over, have their risk and issues, where these Greenfield cities take long-drawn-out periods for the population to settle down and eventually make these cities become sustainable.

There are several funding issues with limited strategic capacity amongst our corporation and state run government bodies where the complexity of payments systems to performances in the Indian context. In the plan for these 100 cities where the establishment of "Establishing Special Purpose Vehicles" (SPVs) to circumvent these local bodies and thus moving away from existing strong holds of the government machinery. Which bring about the risk issues closer to reality checks, if these will withstand the pressures of the new systems of financing things.

- Systematic Risk: It can be mitigated by effective government policy and stable market conditions.
- Unsystematic Risk: Companies should analyze the risk return tradeoff for the project before investment to become profitable.
- Project Risk : Appropriate investment would mitigate this risk
- Over Funding : Thorough project viability and approvals for sanctioning loans
- Regulatory framework : Policy Stability and regulatory framework changes could be predicted

7.3 Challenges in Financing Smart Cities

Following are some of the major areas posing a challenge in development of smart cities as given in the Figure 8.

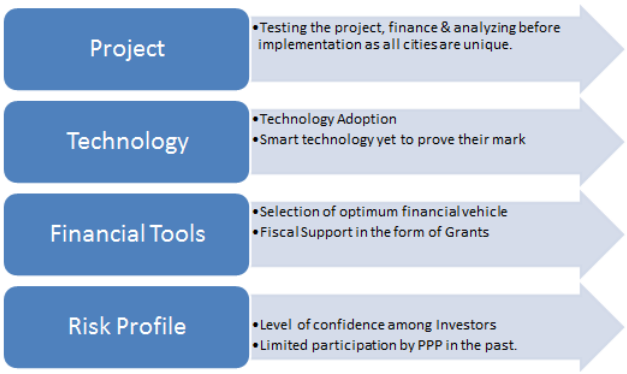

Figure 8. Challenges for Smart Cities Funding.

8. Discussion

This paper studies the major available avenues' for financing of the smart city project for 98cities that is underway as government of India's agenda.

Essentially for the objective of the smart city, the major focus from the government is in its Institutional Infrastructure (including Governance), Physical

Infrastructure and Social Infrastructure, which constitute the three pillars as the foundation, for the purpose of common man living in Smart City.

The smart aspects are inbuilt in smart (intelligent) physical, social, institutional and economic infrastructure, where the ideation is on the simple fact that Smart City will create options for a common man to follow their living and interests meaningfully, this has reference to Competitiveness, sustainability and quality of life.

On average, 90% of the financing in developing countries is self-financed by the consumers and this fraction if changed causes destabilization for sustenance and has scope for further study (Joshua et al., 2007). Countries with higher self-financing ratios grew significantly faster than countries with low self- financing ratios (Joshua et al., 2007). Financial integration may have facilitated diversification of assets and liabilities, but failed to offer new net sources of financing capital in developing countries.

This paper is a review of the methods that can be deployed for the financing of smart cities. We are looking at the Financing vehicle that is created by the government for this purpose.

As per the Reference Note (No.28 /RN/Ref./ November/2014, 2014), where The High Power Expert Committee (HPEC) on Investment Estimates in Urban Infrastructure has calculated a Per Capita Investment Cost (PCIC) of Rs. 43,386 p.a. for a Twenty years. In these estimates basically they have taken into account the basic amenities viz. water supply, sewerage, sanitation and transportation basic infrastructure. With only aggregates at their disposal at present, as the planning is progressing, it is estimated that there are about one million people in these hundred smart cities. And so the budgeting for investment is that of about Rs.7.0 lakh crores over 20 years (with rate of annual escalation of Ten percent from 2009-10 to 2014-15). This translates into an annual requirement of Rs.35, 000 crores.

However these estimates need to be analyzed for the purpose of funding by the Central Government. Moreover, it is expected that most of the infrastructure will be taken up either as complete private investment or through Public Private Partnerships. It is yet unclear on the complete portfolio of the credits that will be put into action.

While the parliamentary report proposes that the contributions from the Central and State Government of India will be largely by way of Viability Gap Support (VGF). Therefore, a large part of the financing for Smart Cities will have to come from the Private sector with the States/Cities and the Central Government only supplementing that effort. The proposed smart methods are feasible instruments and sources of finance. The Greenfield financing is seen a good option to raise majority with - Floor Area Ratio and subsidization for the utilizations. The issue that matters is that the costs adds up and the level of affordability is a key question that needs further studies to understand the levels of costing.

Digital technologies and usage of ICT has a major effect envisaged for the communities and cities. Where the Digital devices are transformational in nature for the anticipated working environments within the region. The systems that are used under governance and so all ICTs will be employed for the government systems. Having the platform to deliver results practices that brings ICTs and people together to enhance the innovation and knowledge that they offer.

At present India has to resolve the basic problems of water shortages and storage, Basic food distribution and storages issues, food security and housing issues which mean that the process to have a fair pricing and such basic problems must be addressed in the first stage. Also the cost of smart part of the city is an over ridden to the basic cost of living which needs to be addressed to make it affordable for a smart city concept to be meaningful.

9. Further Research

There are two very important aspects of the smart city aspects that need further consideration. First is to understand where we are and then where we have to go. It is essential to keep the view of major stages that are needed to change gear to reach the desired level under each stage. The second is that there is major focus on Institutional Infrastructure (including Governance), Physical Infrastructure and Social Infrastructure as the objective of the smart city. We need to decipher how each pillar is intertwined with the other and its sensitivity must be understood in planning and implementation stages itself. The financial aspect completely rides on these issues as the depth and planning implementation and execution will relate to the practical application under each stage. These implications and the teething problems

will help make the concrete structure of every stage to move up in the given time frame in each time period. Urban Development Minister M. Venkaiah Naidu said that money coming from the governments and ULB will act only as the seed money for each Smart City Plan and that cities will have to "be creative in raising the required finance".

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