



Promoting Sustainable Urban Development through Innovative Infrastructure Planning and Development

Ar. Jit Kumar Gupta and Dr Rashmi Asht***

**College of Architecture, I.E.T, Bhaddal, Chief Town Planner, SPCL,
#344, Sector 40-A Chandigarh- 160036*

***Hindu College of Architecture, Sonapat (Haryana)-131001*

(Corresponding author: Ar. Jit Kumar Gupta)

(Received 27 December, 2016 accepted 16 January, 2017)

(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: Urban areas are known to be prime movers of national economies, generators of employment and areas of future concentration of population. Accordingly, for promoting rapid economic growth and physical development, it becomes critical that urban settlements are made more productive, effective, efficient and sustainable. All urban centers need to be supported by appropriate level of physical and social infrastructures for ensuring operational efficiency and providing appropriate quality of life to its inhabitants. Infrastructures accordingly, have been considered to be the foundations on which the entire urban superstructure and fabric is made to stand. Poor quality of life and lower order of productivity prevailing in majority of urban centers can be largely attributed to the non-availability of adequate infrastructures in these centers. Since infrastructures play critical role in leveraging and accelerating the pace of the socio-economic development, accordingly putting in place innovative options and effective policy framework to provide basic infrastructure on equitable basis, even to the poorest of poor of citizens in urban centers, assumes importance. Creating self-sustaining infrastructures and providing efficient delivery mechanism would remain critical for urban centers for ensuring their operational efficiency and livability. In search for appropriate solutions for providing basic and essential infrastructure in the urban context, paper would look at the basic issues creating roadblocks in the provision of these infrastructures and possible options to overcome these problems. Paper would also, critically and objectively, look at the options of providing infrastructure through planned development, making cities compact, defining realistic infrastructure norms and standards, involving communities, promoting people-public-private partnership, using state of art technologies etc

Keywords: Infrastructure, urban planning, compact cities, communities

I. INTRODUCTION

Human history has been scripted and defined by cities and towns as economic and social system in space dotted with high concentration of population; agglomeration of Industry; centers of economy and polity duly supported by large consumer markets and highly trained workforce. Cities represent most viable and suitable places with significant, social and economic achievements making enormous contribution to economic growth and social transportation through economy of scale and proximity that allows industry and commerce to flourish. They are also known to be major generators of employment and centers of excellence and innovations offering optimum location for services and facilities.

Despite housing large population at higher densities, cities are known to offer opportunities and quality of life better than its rural counterparts. Urbanization as a process and experience has been unique in India. It is full of dualities and contradictions. Despite urbanizing at a slow pace with level of urbanization merely standing at 31.11% in 2011, India has emerged as the second largest urban system globally after China with number of urban dwellers standing at 377 million. For the first time in the demographic history, Urban India added more population (91 million) as compared to Rural India (90 million) during the decade (2001-11), putting India on the fast trajectory of urbanization[1]. Indian urbanization is also characterized by large concentration of population and contribution made to the national economy by few major urban centers.

It has been estimated that 10 largest cities, having a population share of merely 8% of the country, produce 15% of gross domestic product, whereas 53 Metro cities housing 13 % country population contributed 33% to the gross domestic product whereas 100 largest cities of the country generated 43 % wealth despite holding 16% of national population^[1]. Considering the massive differential between urban and rural growth rate (2.1% against 0.7%) and based on the projections made, it has been estimated that number of urban dwellers will share parity with rural population by 2050 AD[1]. It is estimated that by the year 2050 number of metro cities will go beyond 100 and 10 million plus cities will number 8 with Delhi, Mumbai and Kolkata occupying distinct place and rating among the largest urban centers at the global level. Looking at future scenario, Urban India is likely to emerge as a distinct and vibrant entity, housing large population concentrated in a limited area making sizeable contribution to the national and global economy. Globally and nationally, numerous studies have been made regarding India's urbanization in the future context in order to understand and analyze India's economic and demographic profile. McKinsey Global Report-April[2], 2010 titled, 'India Urban Awakening :Building Inclusive Cities- projects the Urban scenario of India by 2030 in terms of

- 590 million Indians would be living in Urban India- twice the present US population
- 70% of India's GDP will be generated by cities
- 80% Revenue will be contributed by cities
- Urban India will ensure 4 fold increase in per capita income
- 5 times the number by which GDP would multiply
- Net increase in working age group in Urban India will be of the order of 270 million
- 70% of new jobs (170 mil) will be generated in cities
- 91 million urban households will join the elite middle class(income ranging between 2-10 lakhs per annum)-- up from 22 million
- 68 Cities will join the select band of Metropolises-Europe has only 35 metropolises at present.
- \$ 1.2T capital needed to meet projected demand of infrastructure and services in Urban India
- 700-900 million square meters of residential/commercial space would be needed annually to meet the needs of living, working, leisure, trade and commerce, industries, institutions etc- a new Chicago to be created every year.
- 2.5 billions Square meters of roads would have to be paved, 20 times the space created during last decade, to meet the travel needs of Urban India.

- 7400km (350-400km/year) of metro would need to be constructed, 20 times metros created in last decade, to meet the mass transportation needs in urban areas.
- 200 million Rural Indians living close to top 70 cities of the country would benefit from the prosperity, employment and wealth generated by Urban India.
- 75% of urban India would be living in bottom segment with earnings placed at Rs 80 per day.

Underpinning of the McKinsey Global Report clearly indicates that rapid growth of the urban population has obvious implications in terms of infrastructures and services of the cities. In addition, increased urban productivity and influx of population due to the new economic policies of the government, emerging from liberalization and globalization, will also place heavy demand on infrastructures and services in urban areas. Emerging infrastructure bottlenecks will pose serious impediments in enhancing operational efficiency and productivity of urban areas. Failure to expand water supplies, improve sanitation, expand housing supply and improve transportation to match the growth of population, would emerge as major causes of poverty, operational inefficiency and misery in urban areas. Report also demonstrates the enormous potential urban India has to leverage the economic growth, generation of employment, benefits accruing to rural India, contribution made to national revenue and gross domestic product besides challenges posed in terms of infrastructure requirement and poverty. Report also underlines the critical role and importance of providing appropriate level of infrastructures in order to unleash the enormous potential of urban areas in order to make them engines of economic growth/ development and ensuring India's emancipation from poverty, pollution, slums and lower quality of life for majority of urban residents.

II. INFRASTRUCTURE

Infrastructure is defined as structures, systems and facilities serving the economy, industry, country, city, town, or area, including the services and facilities necessary for its economy to function. In the parlance of urban planning infrastructures are considered as the foundation and basis of urbanization and critical determinant for improving productivity, promoting prosperity, sustaining structural transformation and ensuring operational efficiency in urban areas. Urban infrastructure has distinct division in terms of physical infrastructure and social infrastructure.

Physical infrastructure involves providing water supply, sanitation, accessibility, power, transportation, sewerage etc which take care of the physical needs of human living whereas social infrastructure involving shelter, education, healthcare, entertainment, leisure, open spaces etc are considered critical for promoting quality of life in urban areas. They are considered vital for the reason they are known to be essential input for ensuring quality of development and quality of life in the urban settlements. Despite criticality, majority of urban areas have been found to be deficient as providers of infrastructures. Even where available, quality of such infrastructures has emerged as the major issue. Looking at the existing urban scenario, no city in the country can claim the distinction of providing basic and essential infrastructure covering its entire population. Infrastructures are fast emerging as a commodity serving the needs of rich at the cost of poor. Majority of urbanites find little place in the parlance of availability of basic services, despite the fact they are critical for the quality human living. This has led to dualities and contradictions emerging in the urban areas. Cities, with deficient and inadequate infrastructures, have perpetuated worst kind of living on majority of its population in general and lower section of population pyramid in particular. Urban poor have been found to be the major sufferers of infrastructure gaps and inadequacies. Poor urban infrastructures has promoted not only high degree of operational inefficiencies and urban poverty but have also resulted in poor quality of life for majority of residents. Existence of large number of urban problems has their genesis in the prevailing deficiencies in the urban infrastructures. The root cause of prevailing infrastructure deficiencies has been found to be in the peculiarities emerging from Indian urbanization which is characterized by migration of rural poverty to urban areas; haphazard and unplanned development; uncontrolled growth and expansion of urban settlements; development in peri-urban areas; according low priority to infrastructure; uncontrolled migration and lack of planning, focus, will, resources and capacity on the part of Parastatal agencies involved in providing these infrastructures. In order to make urban development rational and cities more productive, efficient, livable, humane, and sustainable and providers of quality living, making provision of adequate infrastructures, covering entire population, should be considered as priority and essential. Infrastructure for all should be the objective every human settlement should strive to achieve. In the Indian context, the existing infrastructure scenario is both chaotic and full of distortions. As per recent estimates, no city provides water 24 hours a day and 7 days a week, only 70 percent of urban households have access to the safe drinking

water [3]. Only one third had toilet facilities. More than two third population is left uncovered by sanitation facilities. Coverage of organized sewerage system ranges from 35 percent in Class-IV to 75 percent in Class-I cities [3]. The drainage system for rainwater disposal covers only 66 percent of urban population. The city roads are inadequate for traffic requirements leading to congestion and fast deterioration in quality of roads due to excessive load and traffic. Apart from deficiencies in terms of access to facilities, the operation and maintenance of infrastructures leaves much to be desired. Inadequate infrastructures are hampering the development, expansion and sustainability of the major growth centers of the country.

III. ISSUES

Infrastructures as foundation, sustainers and backbone of any settlement structure has strong co-relation with activity location pattern and quality of life prevailing in urban settlements. Providing appropriate level of infrastructure facilities have been considered a pre-requisite not only for improving productivity, promoting operational efficiency and ensuring rational growth and development of urban centres but also for accelerating economic development. In the past, providing infrastructures was considered as the exclusive domain of Parastatal and government agencies. Exclusion of the Private sector as provider of infrastructure had its genesis in monopolistic nature of these services, usually involving high up-front costs and long payback periods besides requiring huge amount of resources and investment. They are also characterized by existence of externalities, making it all the more vulnerable for agencies to recoup investment costs and operational expenses through levy of user charges. Due to limited capacity, resources and ever rising demand for infrastructure, cities are finding it increasingly difficult to provide and maintain infrastructures.

In the Indian context large number of roadblocks has merged which are hampering the provision of urban services. These include, enormous increase in the rate of growth of population, which does not allow bridging the gap between the demand and supply; Melting of cities due to uncontrolled development beyond city limits leading to large network requirements; Multiplicity of agencies with overlapping areas of operation and functions, operating in the provision and maintenance of service at the city level; Capital intensive nature of services; Over dependence on fiscal resources starved public sector for infrastructure provision; Irrational user charges and poor recovery of such charges; Absence of state of art planning and designing of infrastructures; Poor quality of construction; Low priority to maintenance and upkeep of services; Inadequate and

poor quality of manpower involved in provision and maintenance; Low allocation of financial resources to infrastructure development at the national/state/ local level; Poor urban governance and poor delivery of services; Highly subsidized urban services; Irrational norms for planning and provision of services ;Absence of adequate and appropriate space for city level infrastructures; Absence of Master Plans/ Development Plans for urban areas/ infrastructure; High degree of unauthorized/unplanned and sub-standard development.; Non-involvement of private sector in the provision of services; Lack of political will to rationalize the service charges; Existence of large population living below poverty line; Non- involvement of communities and stakeholders; High degree of theft and wastage of services etc

Since infrastructures and services do not pay for themselves and the government does not have resources and financial capacity to subsidize the beneficiaries, this has resulted in low availability of funds. With increasing requirement, this has led to the deficiency in volumes as well as quality of services. Availability of low level of urban services can also be attributed to the fact about one third of the urban population still lives below the poverty line, as defined officially by the Planning Commission based on a survey sourced from NSSO (Report on Indian Infrastructure and Services, March 2011-MOUD) [8]. Issue of requirement of funds for the urban infrastructure has been engaging the attention of planning and development agencies in the county. Assessment of investment required for urban infrastructure has been made by different groups set up by the government from time to time. High Powered Expert Committee (HPEC) constituted in the year 2009[3] by the Ministry Of Urban Development was mandated to quantify the investment requirements for a period of 20 years for eight urban infrastructure and services in Urban India including water supply, sewerage, Solid Waste Management, Storm Water Drains, Urban Roads, Urban Transport, Street lighting and Traffic Support Infrastructure. After detailed study and analysis made of the urban infrastructure in the country, Committee came to following conclusions.

Committee has made projections for the period from the Twelfth Five Year Plan to the Fifteenth Five Year Plan, i.e. 2012-31. Given the volatility of land prices, the estimates do not include the cost of land acquisition. The investment for urban infrastructure over the 20-year period is estimated at Rs 39.2 lakh crore at 2009-10 prices. Of this, Rs 17.3 lakh crore (or 44 percent)^[1] is accounted for by urban roads. The backlog for this sector is very large, ranging from 50 per cent to 80 per cent across the cities of India.

Sectors delivering urban services such as water supply, sewerage, solid waste management, and storm water drains will need Rs 8 lakh crore (or 20 per cent). Explicit provision of Rs 4 lakh crore is made towards investment in renewal and redevelopment including slums. Recognising that the focus of policy should be on provision of public services which flow from infrastructure assets and not merely on creating the assets, Committee highlighted the importance of operations and maintenance (O&M) for the upkeep of the assets. The O&M requirements for new and old assets are projected at Rs 19.9 lakh crore^[3] over the 20-year period.

Thus Urban India will require investment to the tune of 59.1 lakh crores till 2031 [4] to meet the ongoing deficit and additional demand for eight identified services including their maintenance. Bridging the infrastructure gap and providing financial resources of the projected order for creating adequate infrastructures is surely beyond the capacity of public sector and accordingly alternative strategies will have to be evolved to generate resources besides tapping additional avenues for funding the urban infrastructures. In order to achieve the defined goal of total coverage and to make it a reality, a well defined strategy and framework of action will have to be put in place on priority. The defined strategy shall essentially should revolve around promoting planned development; making cities compact; evolving rational and realistic infrastructure norms and standards; using land as a resource and leveraging land based revenue resources; ; declaring infrastructure as priority sector ; promoting cost-effective & innovative technologies; improving service delivery and involving all stakeholders, residents and communities in creating and maintenance of urban infrastructure.

IV. SUGGESTED APPROACH

Infrastructures, as already stated, play critical role in accelerating the pace of socio-economic development, improving productivity, improving quality of life and minimizing poverty of any nation. Accordingly, making available basic physical and social, infrastructure to all the urbanites in India should be the defined goal and objective in the parlance of all urban planning, development and management policies and programmes launched in India. Therefore, it will be important that provision of infrastructures, in urban areas is accorded highest priority. Urban development, as a process and as a product, would accordingly require review and modification so as to facilitate the provision of these services, on pre-defined norms and standards and in appropriate quantity and quality, covering all sections of society.

Appropriate strategies and framework of action would have to be put in place to remove all roadblocks which hamper the provision of such services with innovative techniques adopted to improve their availability. In order to achieve the objective of providing basic infrastructures, even to the poorest of the poor urban resident to improve their quality of life, following suggestions are made;

V. PROMOTING PLANNED DEVELOPMENT

Planned development offers the best option for providing state of art, self-sustaining, qualitative, efficient network and services delivery mechanism for urban sectors. It also offers the best option, if the goal of providing infrastructure for all is to be achieved and made a reality. Globally, effective and systematic planning has been integral part of cities that have been successful in creating state of art infrastructure. Accordingly, promoting planned development will be critical for leveraging the urban infrastructure. In India mechanism of Master Plans/Development Plans have been extensively used by the planners to promote and guide the cities in the realm of planned and orderly development. Preparing Master Plan for urban settlements would accordingly require prioritization in order to ensure the provision of all basic infrastructures to all the inhabitants in an integrated manner over a period of time. Despite best efforts made, Master plans have been prepared only for few large urban centres in the country. Accordingly, most of the urban centres in India are growing by proxy without any development plan with the result, these centres are having large scale haphazard and unplanned development devoid of basic amenities and services. In the absence of planned and orderly development based on norms, most of the urban residents are facing deprivation of basic services. Emerging gaps and overlapping of services and infrastructure are the outcome of absence of a pre-defined growth pattern for the cities. However, in certain cases Master Plans have emerged as the major roadblock in the provision of basic services and amenities due to rigidity in approach and non-implementation leading to large scale violations of these plans. Accordingly, if Master Plans have to be made effective instruments and promoters of planned development, the present approach adopted for their preparation and implementation would need a critical and objective review, revision and redefinition. There is need to bring more transparency in preparing these plans by making communities and all stakeholders as active partners. Process of preparing these plans also needs review to reduce the time frame for their preparation.

There is need to bring inbuilt flexibility in these plans to meet the challenges posed by urban dynamism. All master plans need to be supported and supplemented by preparing master plan for the infrastructure development of each city in order to have a clear vision about the infrastructure requirements of the urban settlement, resources required and strategy to make the services operational along with their maintenance. Thus availability of the Master Plan would be a pre-requisite not only for promoting orderly growth and development but also making provision and ensuring the availability of the critical physical and social infrastructure in the urban settlements. However, Master Plans^[6] will have to be appropriately supported by local level detailed plans including zonal plans and layout plans to make planned development at local level a reality.

VI. MAKING CITIES COMPACT

Considering the cost intensive nature of the infrastructure, a dual strategy needs to be evolved for the planning, development and management of urban services, in order to make optimum use of available resources. The strategy should revolve around minimising the service network and also optimizing their size and spread. For achieving this, cities would be required to be planned and made more compact so that they occupy minimal of space and extent. For making cities compact, it would be essential that population and housing densities defined for cities are critically reviewed and made more rational. Densities defined in master plans are generally very low, which makes the city low density occupying large urbanized area. The spread of the city has obvious implication for infrastructures which also have to be spread over large area, leading to higher cost of development, operation and maintenance. In addition to prescribing higher densities, permissible floor area ratio for various land uses and categories of buildings will also have to be revised on the higher side so as to create more built space within the urban areas to increase the population density and make city more compact. This would require rationalization of building bye-laws governing the built environment so as to achieve the objective of promoting compact city. Compact city, as an approach and strategy, would help in making cities walk able and pedestrian, eliminating the need of mechanised travel and wide roads besides saving the precious agricultural land. Municipal limits also need to be defined with care in order to achieve compactness in the city. Municipal boundaries should be extended only as an exception and not as a rule and expansion should only take place when the existing municipal area is fully developed and land is required to accommodate additional population/activities.

Peri-urban development needs to be effectively regulated and controlled to avoid unnecessary spread of the city/services and its unplanned/haphazard development. Re-densification of cities should also be considered as an option to make city compact by achieving higher densities in low population area by permitting high rise development and higher floor area ratio. All vacant land existing within the city should be taxed heavily to minimize speculation. Plot sizes should also be rationalized to discourage low density development and spread of the city. Flatted development should be given priority instead of plotted development. Transit oriented development on the pattern of Delhi, can also be considered as an option to promote compact development along the lines of communication and minimise the spread of services/infrastructure. Compact cities globally have proved to be more sustainable, economical, efficient and productive as compared to low density settlements.

VII. DEFINING REALISTIC NORMS

Rational, realistic and achievable norms and standards hold the key for the provision of optimum services because they are critical for the quantification of such services in any settlement. Provision of appropriate infrastructure has suffered in the past in the urban centres due to the adoptions of variable and unrealistic norms by Parastatal agencies which has led to under/over provision of these services. In many cases, precious resources have been wasted due to adoption of unrealistic standards of services provided, making them uneconomical and unsustainable over a period of time. Accordingly, it becomes critical that appropriate and realistic norms and standards are evolved for both social and basic services to be provided in the urban area ,so that fair assessment could be made of the requirement of such infrastructures in each of the urban settlement and its provision is ensured on time bound basis. Norms for services will have to be realistic and achievable and should not be too high and unrealistic. Evolution of norms would require detailed study and in depth analysis based on the living habits of society, affordability/capacity to pay, minimum standards to be achieved , quality of life to be ensured and level of productivity to be achieved. Norms and standards can be varied with the economic development and affordability. Norms should be based on making optimum use of available resources and their life cycle implications. In case of activities requiring large land as the basic input, the norms should be based on multiple use of land considering the fact that India is having only 2.45% of global land for supporting 16.7% of population. Land and space norms for healthcare, education, entertainment, open spaces etc should also be made

more realistic, so as to avoid wastage. India has to evolve its own norms and standards keeping in view its peculiar social, economic and physical conditions. Reducing, recycling and reuse should be adopted as the underlying principle to redefine and rationalise the norms and standards for urban infrastructure. National Building Code should take the initiative of relooking and redefining the norms for the urban infrastructure keeping in view the regional/climatic variation, settlement structure, living conditions and optimum use of available resources.

VIII. ADOPTING INNOVATIVE TECHNOLOGIES

Technology has a critical role in the provision of infrastructure. It holds the key for achieving economy and promoting cost-effectiveness in the provision of services. Technology is also the major determinant of the operational efficiency and minimizing the maintenance cost of services and infrastructure. Accordingly, selection of technology for provision and creating infrastructure has to be done with lot of care and caution. In order to improve the availability of infrastructures in urban areas, the technology identified has to be based on existing ground realities and prevailing physical and socio-economic conditions. Outdated and imported technologies used in the past for creating services have resulted in wastage of precious resources. Accordingly innovative, effective and efficient state of art technologies, which are durable, sustainable and cost-effective, need to be adopted for creating infrastructure and services so that optimum use of available resources is made. Cost effectiveness of the services should be quantified over the entire life cycle of the infrastructure and should include both initial cost and cost of operation and maintenance over the entire life span along with its replacement cost. Technologies selected should be able to promote decentralization of services at the area/ zonal level in order to achieve economy and cost- effectiveness. Technologies selected should also be able to promote reduction, recycling and reuse so that the recycled material is used at the local level, minimizing the requirement of expensive city level network. This would be essential for making provision of service like water supply, sewerage treatment etc. Technology used should also require lesser land space, so that provision of such services is not hampered do to constrain of land. Material used for the provision of services should also be based on the considerations of cost-effectiveness, minimum/low level of maintenance, longer life span and minimum replacement. Technology used should be proven technologies to ensure their optimum operation and avoid chances of failure.

Servicing of technologies should be made integral part of the infrastructure to maintain its operational efficiency. It should also involve minimum manpower to make its operation cost-effective.

IX. INVOLVING COMMUNITIES

Large number of infrastructure are remain used, misused and abused in the urban context because providing urban infrastructure has always been government centric to the exclusion of users and communities. Efforts are rarely made to involve communities in their selection, siting, planning, development and management. Accordingly, involving communities and making them active partners in the provision of infrastructure should be considered as critical area, which would require focused attention so as to ensure appropriate usability, provision and maintenance of infrastructures in urban context. Communities are known to be the best agencies projecting the need and requirement of services at the local level. Upkeep and maintenance of open spaces, landscaping, tree plantation and garbage disposal along with sanitation are the few areas where communities can play critical role. Not only communities should be involved in planning, provision of services and creation of assets but their active involvement in maintenance and upkeep of assets would be most valuable in making them sustainable over a larger period of time. Involving communities and working with local talent would help in considerable reduction of the initial and operational cost of amenities provided. Examples have shown that community participation has done wonders in the provision and maintenance of services in many cities. However, involving communities would require innovations, empowerment and focused attention besides creation of associations at the local/ward level. Involving local elected representatives, holding competitions, recognizing good work done and making communities integral part of city planning and development process, will be critical to promote community participation in an effective manner. Enacting Community Participation and Public Disclosure Laws and their effective implementation, setting up empowered Area and Ward Committees, preparing Citizens Report Cards, conducting Social Audit and preparing Market Worthiness Disclosure Statements by ULBs are the other strategies suggested by the High Powered Expert Committee to promote community participation and bringing objectivity and transparency in the decision making process at the local level^[6].

X. INVOLVING PROMOTERS AND DEVELOPERS

Infrastructure development can be accelerated through people- public - private partnership. In such a partnership the advantages of both the sectors can be effectively leveraged to create an enabling environment in which creation of infrastructures becomes speedier and profitable. Construction of ring roads, city level services and amenities are the emerging examples of infrastructure creation under this arrangement. Accordingly, Private sector needs to be involved in a big way in the creation, operation and maintenance of social and physical infrastructures in the urban areas. Technological innovations have permitted low-cost supply options and increasing range and quality of services. In addition, new technologies have considerably reduced the cost of providing these services making infrastructures commercially viable for the private sector. Thus private sector should be given appropriate role by making them co-partners in the creation/provision/operation of local level services and amenities. Involvement of private sector in urban development through granting permissions/licenses to develop colonies/SEZ/Mega Projects/Industrial Estate, offers immense opportunities for creating local and city level facilities without any cost to the urban local bodies [7]. Infrastructure like water supply, sewerage, roads, electricity, open spaces, landscaping, community buildings etc within the colony can be funded by the internal development carried out by these colonizers/promoters at their own level/cost, whereas city level infrastructure can be created through the mechanism of making contributions in the shape of External Development Charges. These charges are ultimately passed on the plot holders as part of cost of land. States of Punjab and Haryana have been able to generate enormous resources from the private colonizers on account of EDC [1] charged on the area developed by them on pro-rata basis. Haryana and Punjab model of resource generation through licensing private colonies can be effectively used to provide quality infrastructure in urban areas using private resources.

XI. CONCLUSION

Infrastructures hold the key to make the cities more productive, functionally effective and operationally efficient besides more livable and sustainable. Deficiencies in physical infrastructures have been acknowledged globally to be major roadblock which constrain the contribution made by cities to the national economy, whereas lack of social infrastructures adversely impact quality of life prevailing in urban areas.

Accepting the role and importance of infrastructure in the urban context, Habitat-II-1996 [8] rightly emphasizes that sustainability of urban areas cannot be achieved without providing adequate infrastructures and services besides ensuring the availability of the services at an affordable price. However, considering the existing large gap between demand and supply in the urban India, providing appropriate level of infrastructure will be both complex and gigantic task requiring huge resources, innovative strategies, state of art technologies, effective policy framework and focused attention. This would also require declaring urban infrastructure a priority area duly supported with allocation of higher resources in the national budget for financing the infrastructure. Well defined mechanism for promoting and ushering an era of planned urban development will have to be put in place to make provision of infrastructure a reality. Planners will have to revisit their planning tools to make Master Plans effective instrument for promoting planned development in urban areas. Creating cost- effective and efficient service network would require cities to be contained in their size and contents and to make them more compact. Compact cities have been found to be highly operationally efficient and cost effective, requiring low level of investment on infrastructure. Norms and standards for urban infrastructure need to be reviewed on priority to bring them on a realistic level. Norms should focus on minimizing waste, promoting optimum utilization and ensuring multiple use of created infrastructure in space and time. Involving communities and all stakeholders in planning, designing and maintenance of infrastructure will go a long way in creating cost-effective infrastructure besides ensuring their optimum utilization. Leveraging the potential of private sector would be critical in creating and maintaining the urban infrastructure by providing right framework and making strategic use of their resources. Land as a resource will have to be leveraged to raise resources for creating infrastructure.

Innovative land based instruments including Transfer of Development Rights, Accommodation Reservation, Land Pooling, Town Planning Schemes, Tradable FAR, Advertisement Rights [7] etc will be required to put in place on priority to promote planned development and generate resources for making provision of adequate infrastructure a reality. With Urban population projected to be 900 million in 2050, providing appropriate level of affordable infrastructures in the urban areas will be the most formidable task, facing planners, administrators and agencies involved in planning, development and management of urban settlements. Our commitment, priority, focus, capacity and capability to meet the emerging challenges through innovations and state of art technologies would hold the key to the provision of infrastructure in the urban areas and would determine the sustainability and future of Urban India.

REFERENCES

- [1]. Ministry of Urban Development ,GOI: Report on Indian Urban Infrastructure and Services March, 2011
- [2]. McKinsey Global Institute: India's Urban Awakening: Building Inclusive Cities, Sustaining Economic Growth, Report April, 2010.
- [3]. FICCI: Urban Infrastructure in India, Report October,2011
- [4]. EAROPH Bulletin, June 1997.
- [5]. Devas Nick and Rakody Carole (Ed) : Managing Fast Growing Cities.
- [6]. Gupta J K: Redefining Strategies for Leveraging Urban Infrastructure Development-published paper.
- [7]. Gupta J K & Monga Ajay: Leveraging Urban Infrastructure for Promoting Rational Urban Development'- Published Paper.
- [8]. NSSO (Report on Indian Infrastructure and Services, March 2011-MOUD).