PARIPEX - INDIAN JOURNAL OF RESEARCH | Volume-9 | Issue-6 | June - 2020 | PRINT ISSN No. 2250 - 1991 | DOI : 10.36106/paripex

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ORIGINAL RESEARCH PAPER

AN APPROACH TO PLANNING OF URBAN INFRASTRUCTURE IN INDIAN CITIES AND TOWNS **KEY WORDS:** Essential urban infrastructure, green infrastructure, water reclamation and reuse, disaster resilience, recycling of solid waste, waste to energy plant

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ABSTRACT

Urban infrastructure development in most of cities and towns of India need large investment. For the purpose, Government of India along with State Governments has taken up several large infrastructure development programs. Although the programs are useful in development of some required urban infrastructure, it has been observed that several such programs are not adequately planned to address the actual infrastructure deficiencies in the cities and towns. There are no long term plans and fund allocations for such programs are not sufficient. In the research paper, the author highlights the urban infrastructure deficiencies faced by cities and towns in India and the works to be taken up in infrastructure development programs.

INTRODUCTION AND CONTEXT

Urban Infrastructure essential in urban areas in India includes water supply, sewerage and sanitation facility, storm water drainage, solid waste management system, transportation infrastructure and energy supply. Some information technology based infrastructure works are also essential in urban areas in India. Governments in India have taken up different programs for development of urban infrastructure in different towns and cities in India. But, urban infrastructure works as taken up are not based on actual requirements of the cities and towns. Although, consultations with citizens are done in planning stage of each infrastructure development program in India, actual requirement of works is not fully addressed in such programs. In each of the programs, only some parts of the requirements are addressed. Also, works included in the programs are not based on long term infrastructure development plans of the cities and towns. The author, based on his experience in infrastructure projects in different parts of India, has attempted to identify the essential urban infrastructure needed in urban area of India. Government needs to make attempt to develop these essential infrastructures in future infrastructure development programs.

STATUS OF URBAN INFRASTRUCTURE IN INDIAN CITIES AND TOWNS

The general status of urban infrastructure in Indian cities and towns can be explained as below:

- I) Most of Indian cities and towns in India are covered by piped water supply systems. But, many of the towns are partially covered. Also, per capita water supply varies in different towns. In most of the towns, per capita supply is less than 135 liter per capita per day. Water supply is intermittent. Many towns are facing inadequate water availability at water sources. The problem of insufficient water availability at source is severe for the towns, where there is no river nearby with perennial flow of water. The water source problem is severe in some parts of southern India. Generally, leakage of water in pipe network is high and therefore high quantity water is wasted during transmission and distribution. In most of the towns, there is no water audit. Details of water distribution network laid in the towns are not available in the offices of urban local bodies and concerned government departments. SCADA (Supervisory Control and Data Acquisition) system is not installed in water supply schemes in most of the towns.
- ii) Many towns and cities in India are not covered by sewerage network and do not have sewage treatment plants. In many towns, where there are sewage treatment plants, the plants are not functioning properly. In towns covered by sewer networks, large parts of the towns are not covered by sewer network. Individual household

toilets with septic tanks are mostly used by residents in the towns. Partially treated sewage coming out of septic tanks is released into road side drains. Septage management or collection of wastes from septic tanks of individual households and their scientific disposal are practiced only in limited cities and towns in India.

- iii) In most of the towns and cities, road side open drains function as storm water drains. The sizes of road side drains are mostly insufficient to carry storm water during major rains. The major drains in the towns and cities are not adequately sized to carry storm water during major rains. The major problem in most of the drains is disposal of solid wastes into the drains. The drains are clogged with solid wastes. Periodically, solid wastes are removed from the drains. Urban flooding is a major problem in many towns with moderate to heavy rainfall.
- iv) Solid waste management is major problem in most of the towns and cities. Part of the generated solid wastes is not collected. Mostly, there is no segregation of solid wastes at sources. The major problem faced by many urban local bodies is unavailability of solid waste disposal sites. In most of the towns, there is no sanitary landfill. Collected solid wastes are simply dumped at disposal sites. In towns, where there are no disposal sites, collected solid wastes are dumped on periphery of the towns.
- v) Traffic congestion is a major problem in many cities and urban areas in India. Due to increase in population and narrow roads, travelling from one location to another location within the same town takes much longer time. Transportation network within many towns and cities has become inadequate. Damaged pavement or road surfaces are not repaired at required interval. There is no foot path in most of the roads. Parking of vehicles is a major problem in commercial and market areas in most of cities and towns in India. These problems are severe in all old cities of India. In many old cities in India, overhead electrical power lines on the sides of roads are causes of accidents and give a bad view of the areas.
- vi) Unavailability of open space and degradation of existing open spaces within the cities and towns in India have become major problems. Numbers of public parks and open spaces are limited in the towns and many of existing parks and open spaces are in dilapidated condition. Parks and open spaces are not maintained.

EVALUATION OF URBAN INFRASTRUCTURE DEVELOPMENT PROGRAMS INITIATED BY GOVERNMENT

To meet the infrastructure deficiencies in urban areas in India, Government has taken up several large infrastructure development programs. A summary of the programs and works taken up in them are highlighted below:

I) AMRUT Mission: In the mission initiated by Government of

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- India, infrastructure has been developed in 500 cities and towns all over India. Total fund allocation by central government in the mission is Rs. 50000 crore. In the mission, water supply and sewerage infrastructure along with development of selected parks are taken up in the selected towns. One major shortcoming in the program is that actual availability of fund in each selected town is less. Therefore, no major works are taken up for augmentation of water supply system, construction of sewerage and storm water drainage system. Most of the towns covered under AMRUT mission do not have long term master plans for water supply, sanitation and storm water drainage systems. Long term master plans were not prepared under the mission. As a result, works taken up in the mission were incremental to existing water supply, sanitation and storm water drainage systems.
- ii) Smart Cities Mission: It is a major urban renewal program initiated by Government of India to improve living condition of people by upgrading infrastructure in 100 selected cities in India. The total central fund allocation for all the 100 cities is about Rs. 48000 crores, which is substantial. But, essential infrastructure works such as water supply, sewerage, storm water drainage, road network and solid waste management are taken up only within Area Based Development area defined under the smart city mission. The area based development area covers only about 10% of total area of the cities. Thus, essential infrastructure deficiencies of the cities are not addressed in the smart city mission. The major pan city level useful infrastructure being developed under the smart city mission are Integrated Central Command Centers (ICCC) in almost all cities covered under the mission. The main components of the ICCC project consist of an integrated central command center, intelligent traffic control system with traffic enforcement, public address system, emergency call box citi wifi system, citizen web portal, e-governance service solution, etc.
- iii) Swach Bharat Mission (Urban):

Swachh Bhart Mission (Urban) covers all statutory towns in the country, which is about 4041. Out of the total project cost, central government assistance is Rs. 14,623 crore, while states governments have contributed Rs. 4,874 crore in total. The major activities performed by urban local bodies under Swachh Bahrat Mission are construction of toilets to make the urban areas open defecation free. Also, in some cities, solid waste collection and transportation equipment are procured. One of the major problems faced by urban local bodies in India, is scientific disposal and treatment of solid wastes. Development of waste recycling facility, sanitary landfill, compost plant and waste to energy plants are not taken up under Swachh Bharat Mission. Thus, a major problem of solid waste management is not addressed under the mission.

iv) Jawahar Lal Nehru National Urban Renewal Mission:

JNNURM was a major mission for development of urban infrastructure in India. The mission had two sub missions. Out of these, in Urban Infrastructure and Governance (UIG) sub mission, water supply, sewerage, storm water drainage works and other urban infrastructure works were taken up in 65 selected cities. In the other sub mission titled 'Urban Infrastructure Development Scheme for Small and Medium Towns (UIDSSMT)', 671 cities were covered. Total central allocation of fund in UIG sub mission was Rs. 42900 crores, while fund allocation for UIDSSMT sub mission was Rs.39000 crores. As numbers of cities covered under the UIG submission were limited, actual fund available to each city covered under the sub mission was substantial. Hence, major water supply, sewerage and storm water drainage works were taken up under UIG sub mission. But, under UIDSSMT sub mission, actual fund available to each town was much less.

Consultants were engaged by respective state Governments for preparation of detailed project reports for the works. Detailed project reports were reviewed and approved by CPHEEO, New Delhi. Most of the cities covered the mission did not have long term master plans for water supply, sewerage and storm water drainage. However, the detailed project reports were prepared based on CPHEEO guidelines and suggestions, which were technically reasonable.

 v) Heritage City Development and Augmentation Yojana (Hriday)
Under the scheme, 12 heritage cities of India are developed with a total central fund allocation of Rs. 500 crores. The project is a useful project. Its coverage is confined to limited number of cities. The project is for development infrastructure such as toilets, drinking water facilities, street lights and improvement of roads foot paths etc. in the core areas of the selected cities.

MODERN CONCEPTS OF URBAN INFRASTRUCTURE RELEVANTTO INDIAN CITIES AND TOWNS

The concept of urban infrastructure in the world is evolving and new concepts are now being discussed and implemented. Out of these new concepts, some are very much relevant to Indian context as these concepts will strengthen the essential urban infrastructure required in India. Some of the relevant concepts are as below:

- I) Disaster resilience of Urban infrastructure: Bringing in disaster resilience in infrastructure involves several aspects such as disaster risk assessment in planning and design stage, vulnerability analysis, designing critical infrastructure with higher factor of safety to withstand any kind of disaster, supplementing infrastructure with additional safety features, storm and fireproofing of infrastructure, reducing vulnerability to urban flooding by conservative design of storm water drainage network, etc
- ii) Green infrastructure includes innovative distributed storm water management infrastructure such as green roofs, rain gardens, bioswales, tree-lined streets, parks and gardens, open spaces, urban farms, etc. Ecosystem benefits of such green infrastructure include reduced storm water flows, improved water and air quality, reduced urban heating, increase in biodiversity, etc. Studies indicate that green urban areas can improve property values and have multiple social, economic, health, and psychological benefits. There is also a realization that urban agriculture as a form of green infrastructure is useful and can enhance community level food security. As a whole, green infrastructure can mitigate negative effects of urbanisation to residents and urban ecological system.
- iii) Wastewater reuse practices: Reuse of municipal wastewater is a promising solution to contain fresh water demand in urban areas. In Indian context, projects on reuse of waste water will also ensure that waste water treatment plant functions efficiently. Urban local bodies of India or are reluctant to take up waste water reuse projects as waste water treatment plants generally do not function efficiently.
- iv) **Urban regeneration by water front development:** Water front development can be taken up on the bank of any river, lakes and water bodies within urban areas. Such projects lead to rejuvenation of urban areas. But, such projects are not easy to design and implement due to lack of interdepartmental coordination, ownership issues of land near rivers and water bodies, difficulty in removing encroachments, etc.
- v) Urban mobility: Mobility with ease within urban area is a bigger challenge in India due to increase in population and vehicular traffic. For this, every major towns and cities needs to prepare long term comprehensive mobility plan. The outputs of such mobility plan will decide the required widening of

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road, improvement of road junctions, provisions of vehicle parking areas, introduction of new modes of public transportation such as bus rapid transportation system, etc.

- vi) **Recycling of solid waste, waste to energy plant:** Formal practice of recycling of urban solid waste is very less in India. Recycling of waste is essential for success of urban solid waste management problem in India. Along with recycling facilities, compost plant and waste to energy plants are also needed. Success of waste to energy plants in India is limited. Hence, successful technologies from developed countries need to be utilized. This is possible by foreign direct investment and private sector participation to construct waste to energy plants in India.
- vii) Smart Energy Grid: Projects for creation of **smart** electrical **grids**, which includes **smart** meters, **smart** appliances, renewable and energy efficient resources, need to be taken up in urban areas of India. Such projects will help in reduction of power failures in urban areas.

RECOMMENDATIONS FOR PLANNING OF URBAN INFRASTRUCTURE PROJECTS IN INDIA

The following recommendations are made for selection of works in any urban infrastructure development programs in India:

- India is a large country with many cities and towns. Requirement of urban infrastructure in these cities and towns is very high and large funds are needed to build them. As availability of fund with Government is limited, only essential urban infrastructure works needs to be funded by Government.
- ii) The essential infrastructure works for any urban area includes the following:
- Piped water supply to each households of the urban areas including households in low income areas of the city. Pipe water supply systems should have provisions of water audit and SCADA systems to minimise losses of water.
- Sewerage system to cover most parts of the urban areas along with sewage treatment plants. Works for recycling of treated sewage need to be part of sewerage systems. Septage management projects need to be taken up in towns not covered by sewer network.
- Road side drains and storm water drainage system covering all areas within cities and towns. Construction of bioswales and green infrastructure should be parts of storm water drainage systems.
- Solid waste management system including processing, recycling, treatment and scientific disposal of wastes. Compost plant, recycling facilities and modern technology based waste to energy plants needs to be taken up in all cities and towns.
- Improvement of roads, road junctions, foot paths and parking facilities to improve mobility in all cities.
- Development of parks and open spaces covering substantial areas of the city.
- Integrated central command center in the cities along with intelligent traffic management system, city surveillance, etc.
- Works for urban regeneration such as development of river fronts and rehabilitation of urban lakes.
- Works for smart energy grids in cities and towns.
- iii) Fund allocation in each of the 100 cities covered under Smart Cities Mission is substantial. Hence, essential urban infrastructure as mentioned above should be provided in the entire city, rather than within ABD area only, which is only about 10% of total area of the city.
- iv) All urban infrastructure works as mentioned above need to be developed based on long term master plans for each of the sectors. Long term master plans are to be prepared.
- All non essential urban infrastructure works need to be developed on PPP mode only. Government fund should not be utilised even for viability gap funding of non

essential projects. Governments need to avoid funding of non essential urban projects developed and practiced in rich countries.

vi) Institutional reforms are essential in urban local bodies in India to enhance their technical and managerial capabilities for efficient implementation of large urban infrastructure projects.

Disclaimer: The findings and conclusions presented in the paper are personal opinion of the author.