Paper presented at the 22nd Asian Conference on Remote Sensing, 5 - 9 November 2001, Singapore.

MONITORING OF URBAN INFRASTRUCTURE IN CITIES AND ITS FRINGE AREAS THROUGH REMOTE SENSING.

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ABSTRACT:

With rapid growth of urban population there has been continuous accretion in number and size of urban centers both demographically and spatially. Provision of urban infrastructure has, however, not kept pace with increasing size of towns and cities. As a result burgeoning urban areas are putting strain on the already scant infrastructure leading to a point of collapse. Large urban centers, although considered to be generator of economic momentum, display a picture of squalor and unhygienic conditions. Traditionally in India, urban local bodies and parastatal agencies have generally been providing urban infrastructure as part of social and welfare services. Of late the concept and techniques for provision, delivery, operation and maintenance of urban infrastructure have changed considerably. It is increasingly being felt that government alone with limited budgetary resources would not be in a position to make up the galloping backlog in urban infrastructure services which are also required to be improved, augmented and upgraded to meet the emerging needs of urban areas.

INTRODUCTION:

Urban infrastructure planning in existing urban texture depends upon two factors; one is establishing the proper norms to assess the available infrastructure and its accessibility and other is a base map on larger scales for planning. The critical issue of planning is to estimate the demand of infrastructure based upon population projection. At present, planning of infrastructure is carried out by conventional method, which is slow and to speed up this process, high resolution satellite data could be used. It can supplement for physical data, which is vital for planning otherwise surveying for this data may delay the entire project planning. Inventory of urban infrastructure is possible through fieldwork and collateral data. Apart from the conventional system, in this paper, possible applications of remote sensing in planning the physical infrastructure are described.

We need GIS, because, today we are in the age of Information Technology (IT), but unfortunately the common man does not know how it will help him or the municipal functionaries. For the purpose of municipal affairs a geographic information system will be essential in the days to come. Geographic Information System is nothing but a computerized database attached with a computerized map. GIS is used for three main reasons. Firstly, it is due to the power of graphic representation of information. Secondly, information becomes instantly retrievable from any location of a map. Thirdly, queries can be used in GIS to retrieve only relevant data from the maps one is working with.

Status of Urban Infrastructure:

Infrastructure may be defined as the physical framework of facilities, utilities and support system through which goods and services are provided to the public. Infrastructure facilities are generally grouped into two major categories i) physical infrastructure comprising of water supply, drainage, sewerage, water disposal system, transportation, power and ii) social infrastructure which includes education, health, telecommunication, security, fire-fighting services, socio-cultural, recreation parks, banks and financial institutions, housing and other services. In the absence of detailed information on various components of physical and social infrastructure analysis of selected facilities and services reveal a grim picture in urban areas with regard to availability of basic infrastructure.

On an aggregate, 21 percent of urban population is living in slum and squatter settlements, where access to basic services is extremely poor. Although 83% of urban population is reported to have access to safe drinking water, there are severe deficiencies in quantity and quality of water available to urban residents. About 49% of urban population is covered with sanitation facilities while rest of the urban population is devoid of such services. Nearly 46% of urban household have water borne toilets but only 28% of the urban households are connected to

the public sewerage system. As per the survey conducted by the Central Pollution Control Board (CPCB) even among metros only 5 metropolitan cities have proper wastewater collection system.

The position with regard to solid waste management is no better. It is estimated that about 80,000 metric ton of solid waste is generated every day in the urban centers of India. About 60% of the solid waste generated is collected for proper disposal. The uncollected solid waste is generally disposed off either to fill the open space in and around the locality or into the drains and along the roads thereby causing insanitary conditions and spread of diseases in the towns and cities.)

None of the metropolitan cities in the country have 100% underground collection system. It varies between 33% Lucknow and 97% in Kanpur with a weighted average of 74%. The coverage of underground sewerage system varies between 24% in Nagpur and 85% in Pune with a weighted average of 60%. In the metropolitan cities 100% of the sewage is not subject to treatment before disposal. Sewage treatment facility is available for a total flow of 960 mld. Which is 22% of the flow rate generated. Although nearly 300 urban centers have sewerage system only 79 towns / cities have sewage treatment facilities. Of the total garbage generated in urban areas, only 60% is being collected by the municipal authorities while the rest remains un-collected. As far as sanitation facility is concerned about 35% of urban residents have access to sewerage system, 15% have septic tank system, 20% have service latrines and the remaining 30% use the open spaces.

AFFECT OF INADEQUACY OF SERVICES:

Inadequacy of infrastructure not only affect the quality of urban life and living environment but also create the problems of law and order and dis-functioning of urban system. Urban areas are confronted with myriad problems, which are directly or indirectly related with deficiency or inefficiency of urban infrastructure services. Air, water and noise pollution, increasing incidence of fire, urban crime are some of the adverse impact of shortage and imbalances of basic urban services. Considerable proportion of urban population particularly in large and metropolitan cities live in marginal settlements, slums and squatter areas with limited infrastructure services. All such people are greatly exposed to grate risks in terms of diseases, loss of livelihood, shelter and even loss of life. Urban communities of these areas become increasingly vulnerable when high density areas with poorly maintained infrastructure are subject to natural hazards, environmental degradation, fires, flooding and earthquake, Lack of infrastructure also cause urban security problems.

MAJOR ISSUES OF PLANNING AND MANAGEMENT OF URBAN INFRASTRUCTURE

PHYSICAL: In the most of the cities the development is taking place in a lopsided, non-contiguous manner without proper sequence in the provision of infrastructure. The Development plan is often vitiated which lead to unintended growth in terms of slum/squatter, unauthorized colonies, encroachments, land use transformations, violations of Building Bylaws etc.

ORGANIZATION: Multiplicity of organization involved in Urban Development with overlapping functions. There is lack of co-ordination and poor information flow between the agencies, which results into non-sequential development.

MANAGEMENT: Traditional methods of management still prevailing and there is no system of sequencing of inter agency activities and fixing up responsibility.

FINANCIAL: No consideration of resource flow in Development plan. Funds for urban development are highly inadequate and annual targets and budgets of different agencies are independent of Development plan.

LEGAL: No monitoring mechanism prescribed in the prevailing, Town and Country planning acts of different states. Also there is no legal binding on different agencies to supply the regular feed back to each other involved in this process.

GIS CAPABILITIES IN PLANNING AND MANAGEMENT OF URBAN INFRASTRUCTURE:

Any decision to be taken by authority requires information plainly speaking, information is useful only when it can be used for taking some decisions. Hence information is useful only if:

* It is the right information required for taking the decision.

* It is received at the right time before taking the decision.

Obviously we have to use the power of computers to get accurate and updated information at the exact time when it is needed. No human system can be provided with such accuracy and speed. Here is the need for a computerized information system.

To speed up the process of planning and management of urban infrastructure in cities and its fringe areas high resolution satellite data could be used for planning water supply, Sewerage network Planning, Storm Water Drainage Planning and Solid Waste Management and planning.

APPLICATION OF REMOTE SENSING FOR PLANNING WATER SUPPLY AND DISTRIBUTION:

PHYSICAL

- Location of source of surface water and ground water potential zones
- Stream network and watershed geometry information
- Location of service reservoirs
- Land use surrounding the water source areas
- Distance to the town from water source
- Street layout maps where water lines can be marked with fieldwork.
- Type of built up structure in town with fieldwork to determine the density of population.
- Growth of town and direction.

ENVIRONMENT

- Estimate of population through air photo technique.
- Water requirement demand in different residential areas through population estimate.
- Development in accordance with zoning regulation plan implementation.
- Physical barrier curbing the growth of town.

In fringe areas localized water supply systems exist and they do not cost any thing to the authority. Due to inadequate sanitation, especially in the disposal of wastewater, sources are liable to pollution and can create health hazard. In this case local bodies monitor the water quality and sanitary conditions of the locality. Private participation should be encouraged in this regard.

REMOTE SENSING APPLICATIONS IN SEWERAGE NETWORK PLANNING

Remote sensing is useful data in generating the physical data and it can be integrated into conventional planning system for sewerage network planning for following.

PHYSICAL:

- Location of sewage treatment plants.
- Sewer system and land use surrounding the area
- Layout system of sewers with reference to street pattern.
- Town growth and development trend to locate sewage farms.
- Location of different land uses, which are suitable for sewage farm of treatment plant.
- Selection site for sewage treatment works based on the development pattern.
- Identification of dense developed areas for sewer line planning.
- Planning of sewer lines in urban expansion areas.

ENVIRONMENT:

- Environment around the sewage farm and along the sewage lines.
- Impact assessment public health, pollution (land and air) through secondary / primary data.

APPLICATION TO REMOTE SENSING IN STORM WATER DRAINAGE PLANNING

- Mapping of natural drainage system
- Drainage network planning of streams of open drains in city
- Land use-degree of impervious surface in city
- Extent of city growth for planning storm water drainage system
- Identification of swampy/waterlogged areas, flood prone areas
- Input for storm water runoff modeling mainly land cover.

REMOTE SENSING APPLICATION TO SOLID WASTE MANAGEMENT AND PLANNING:

- Solid-waste source areas like industry, residential, open space, recreational; institution etc. can be identified through land use maps.
- An inventory of built up area type (dense/sparse).
- Gross regional population can be estimated with collateral data. If solid waste multipliers are available for town or region, solid waste can be estimated.
- Direction of urban expansion can be determined and potential waste disposal areas in danger of urban encroachment can be identified.

WASTE DISPOSAL SITE SELECTION FOR SANITARY LANDFILL:

- Regional Geology (especially important for siting sanitary landfill sites).
- Regional Hydrology Surface drainage.
- Regional land use: Availability of open lands for dumping garbage and the relationship of these areas to surrounding cultural features.
- Transportation routes: Distances from major (urban) waste source areas to proposed and waste disposal areas can be identified.

CONCLUSIONS AND SUGGESTIONS

In view of the urgency of increased provision of urban infrastructure, some of the vital planning, management and policy issues were discussed in this paper. Following conclusions and suggestions are made:

- The constraints to increased supply of urban physical infrastructure in different cities would continue so long as the viability of government sponsored schemes or operations is eroded by poor cost recovery and various inefficiencies, and hence alternative systems of financing urban infrastructure is called for.
- Urban authorities should actively promote housing development on residential land equipped with low-cost sanitation and water supply solutions.
- Infrastructure investments are lumpy and durable. Therefore, it is essential to plan the infrastructure network cost-effectively, in tune with the desired as well as the emerging spatial pattern in the city region with appropriate designs using remote sensing and GIS technology.
- The scope for involving the private sector, co-operatives and community in the provision and maintenance of Urban Infrastructure Development could be worked out through various systems.

- Deficits in infrastructure in terms of water supply and sanitation, power, transport and communications have to be met as expeditiously as possible.
- No infrastructure should be provided free. Infrastructure is more likely to be economically efficient when it is subject to user charges. User charges should be based on economic prices and willingness to pay.

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