EVALUATION OF URBAN TRANSPORTATION PLANNING AND ENVIRONMENTAL IMPACT ASSESSMENT (EIA) WITH REFERENCE TO HYDERABAD METRO RAIL- A GIS APPROACH

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ABSTRACT

In this paper an attempt has been made to use geographical information system (GIS) to study one of the three high density corridors of Hyderabad Metro Rail. All the issues related to planning, construction and implementation along with its impact on traffic and environment were addressed. GIS techniques/ maps were used to analyze the study area including location of metro stations and also the effects on surrounding environment, heritage and religious structures etc. Environmental Impact study report was prepared using GIS with reference to land acquisition, loss of green cover, effects on environment during and after construction viz. air quality, noise, vibrations etc. and measures for its mitigation were also suggested. Contour maps were used to know the drainage conditions and it was found that slope is towards musi river. A detailed report on positive and negative impacts of metro rail was also presented.

Keywords: Urbanization, Environmental Impact Assessment, GIS etc

1. INTRODUCTION

Hyderabad is a mega city that covers 625 sq. km. of municipal corporation area and 6852 sq. km. of metropolitan area. It is fast emerging as the hub of IT, Biotech, Pharma and Tourism sector. Its strategic geographical location, multilingual and cosmopolitan culture, tremendous growth potential and investment-friendly economic policy are all making it an attractive destination for corporates, entrepreneurs, academicians and homemakers alike. The increasing pressure of the burgeoning population is putting Hyderabad's Transportation System under constant pressure. The need of the hour is a robust system that is dependable, comfortable, affordable and sustainable. Its population stands at 8 million and is projected to touch 13.64 million by 2021. Currently, over 2.8 million personalized vehicles ply on Hyderabad roads, with an addition of 0.20 million vehicles every year. 8 million

motorized trips are made every day, of which, only about 3.36 million or 42% are made by the Public Transportation System (PTS) i.e., buses and local trains. That means the rest of the trips are made by personal vehicles leading to traffic bottlenecks, high pollution levels and a steep increase in fuel consumption.

Hyderabad Metro Rail Limited is the Government Enterprise, which had initiated the Metro rail project for Hyderabad. The Project was allotted to L&T company in Public Private Partnership (PPP) mode. Metro Rail was approved for 71.16 km., covering three high density traffic corridors of Hyderabad. The Metro Rail System has proved to be the most efficient in terms of energy consumption, space occupancy and numbers transported. Hyderabad Metro Rail project covers three high density traffic corridors of Hyderabad:

(1) Miyapur-LB Nagar (28.87 km - 27 stations)

(2) JBS-Falaknuma (14.78 km - 16 stations)

(3) Nagole-Shilparamam (27.51 km - 23 stations) Total: 71.16 km; 66 stations

The proposed viaduct structure for the Hyderabad Metro is a 'U' shape deck carrying two tracks on single pier located on the median of the road. The width of the deck is 9.1 m and the pier 1.45 m to 1.6 m in diameter. A road clearance of 5.5 m is ensured below the viaduct structure. The foundation shall be open foundation at most of the locations though pile foundation socketed in rock may be necessary at certain isolated locations. The superstructure shall be pre-cast segmental construction which will cause minimal inconvenience to the road users.

II SCOPE & LIMITATIONS

- The scope of the study is to understand the role of Metro rail project and also the issues related to its planning, construction and implementation.
- Its impact on the traffic and environment.
- Its influence on the people, business, land use and other factors along the route.
- Its impact on the urban infrastructure.
- The study is limited to one route of the Hyderabad Metro rail project out of three proposed routes.
- Prototype metro station design to understand the impact on surroundings.

III OBJECTIVES

- The need of Metro rail project to solve the traffic issues in Hyderabad.
- Impact on the city environment and scope of EIA (Environmental Impact Assessment).
- Impact on the land use patterns.

IV STUDY AREA ANALYSIS

- The area allotted for proposed MGBS metro station site is 3.776 Acre. The site is 8m height from Musi river bed. The land is flat and covered with grass and few trees. Part of the site is used for APSRTC bus

shed and petrol pump. Another part is used as dhobi ghat. It is having good connectivity to the MGBS bus station.

- Sultanbazar area is having very narrow road of only 10m and busy with road shopping. As per the master plan the proposal is to widen upto 30m by demolishing business complexes and old houses. The people in this area are opposing this proposal as it spoils their livelihood.

- Infront of OMC there are many bus stops, small shops and hawkers. The metro construction may have impact on them.
- Salarjung museum area is surrounded with many heritage structures, religious structures, landmarks and old constructions having heritage value.
- Malakpet area roads are narrow and heavy traffic, There are many religious places and institutions in this area.
- There are 154 buildings to be demolished in the study area for road widening for the construction of metro corridor according to the HMR proposal.
- There are 164 trees to be cut in the study area according to the HMR metro corridor proposal. • There are possibilities of contamination of Musi River as the pillars will be constructed in the river.

V MATERIALS AND METHODOLOGY

i) General

1. Data Collection & Desk Study
2. Case Study: Study of an operating Metro rail project in other city.
3. Defining the Study Area.
4. Site visit of Study Area
5. Prototype metro station design
6. Analysis and interpretation
7. Impact on Environment.
8. Impact on Traffic.
9. Influence on Land use Pattern

ii) The Environmental impact study

The environmental impact study is prepared based on the prevailing status of environmental, ecological resources and socioeconomic conditions of the population in and around the project area. The observations and survey results were analyzed and were used as main tools for planning the project.

The planning essentially envisages the following stages of the Metro Rail Project:

a) Design

- Land acquisition and rehabilitation

- Loss of Green Cover
- Landscape and Visual
- Geology of Soils
- Traffic
- Archaeological & Historical monuments

b) Construction

- Traffic
- Air quality
- Noise and vibrations
- Disposal of excavated earth and water from the tunnels
- Water resources
- Ground water aquifers
- Exposure to hazardous substances
- Safety and Security
- Health and Hygiene at Project sites
- Disposal of demolished building debris

c) Operation and Maintenance

- Air quality
- Traffic
- Noise and Vibrations
- Energy Resources
- Safety and Security

VI RESULTS & DISCUSSIONS

1. General

- The environmental issues that must be addressed while designing new transportation facilities. Transportation issues extend to pedestrian and bicycle circulation.
- Neighborhoods should not be divided and quality of life should be improved.
- Provision of rapid access to the city center, for education, shopping, recreation, and to government services will enhance the quality of living.
- The Metro line at 6m height from road level, creating a visually ugly cityscape. Visual and Aesthetic Conditions should be controlled by design.

- Electric trains such as Metro Rail pollute far less than buses if the electricity is produced by burning oil or coal, and the pollution is concentrated at power-generating plants rather than being spewed along the course.
- Water Resources and Water Quality are matters of concern where a transportation facility crosses or passes near a floodplain or wetlands.
- Historic, Archeological, and Cultural Sites must be protected.
- Further major demolition of existing structures and acquisition of land for stations displacing people, affecting very old heritage structures.
- The road users are endangered by the running train overhead, which on escaping from the rail guidance, derails and have potential to destroy vast properties and many lives using the road.
- The noise pollution of the trains is a factor adversely affecting the quality of life.
- The elevated metro rail cannot take care of trucks and cargo supplies within the city and the problems of transporting the refuse using road based vehicles will continue.
- Central lane BRT will become impossible
- Stations will have to be created at distances of every one km. As per plans, these will be 30-36 meters wide, 140 meters long and 15- 25 meters high.
- Buildings close to the Metro station will face problems of light, ventilation and continuous noise. Access to these buildings will become narrower.
- During the construction citizens will have to suffer with re-routing and diversion of traffic. Road condition during rains will be unsafe. Pedestrians will be badly affected. Disabled will be worst hit.
- Older persons, patients, pregnant women, children and pets in houses close to the elevated track will suffer.
    - Citizens will suffer loss of livelihood, business, and comfort; and spend more time and money on travel and fuel.
    - Hundreds of trees will be cut. Pollution will increase. Open spaces will vanish. View of historical monuments will be affected.
    - During operation there will be reduced congestion on road, faster and safer, reduced fuel consumption, reduced pollution etc.
    - The elevated metro will change the road character and the entire streetscape.

2. Mitigation Measures during Construction

i) Air Quality and Dust

- All dusty materials shall be sprayed with water prior to any loading, unloading or transfer operation so as to maintain the dusty materials wet.
- Stockpiles of aggregate or spoil shall be covered and water applied.

- Vehicles delivering loose and fine materials like sand and fine aggregates shall be covered to reduce spills on roads.
- The height from which excavated materials are dropped shall be controlled to a minimum practical height to limit fugitive dust generation from unloading.
- All vehicles, equipment and machinery used for construction shall be regularly maintained to ensure that the pollution emission levels conform to the CPCB norms.
- The random ambient air quality monitoring shall be done to ensure that the significant impacts are being mitigated adequately.

ii) Noise

- Construction shall be carried out in accordance with standard procedures. All plants and construction equipments shall be fitted with noise control measures and shall strictly conform to the MoEF/CPCB noise standards.
- On-site power generator sets shall be covered with an acoustic enclosure and fitted with muffler and shall conform to the noise emission standards.
- Servicing of all construction vehicles and machinery shall be done regularly and during routine servicing operations, the effectiveness of exhaust silencers will be checked and if found defective will be replaced.
- Vehicles hired for bringing construction materials at site shall conform to the noise emission standards and shall be operated during non peak hours.

3. Positive impact of Metro rail

a) Reduction in Air Pollution:

This is the single most important factor for promoting a better and healthy city and ensuring a better quality of community's health. From the estimates made, the Metro operation can bring down air pollution loads by an average of 30% from the existing situation with an overall improvement in city's air quality. In operation, it is a non polluting and environmental friendly system.

b) Traffic Decongestion and Road Safety:

While ensuring a rapid, user friendly mode of transportation, the Metro Rail would effectively bring down the congestion problems on city roads to an extent of nearly 30%. While achieving substantial decongestion of the roads, this will also ensure that the accidents on the roads will be brought down by the same. Additionally, as significant traffic load will be taken over by the Metro Rail, the vehicle density on the roads will be less thus leading to reduced stress on the road with consequent lease of longer life to the existing road network.

c) Development of Suburbs:

Introduction of Metro Rails is expected to promote the orderly growth of suburban areas of the city with economic benefits and providing a good infrastructure to the neighboring rural community. An all round improvement in employment opportunities is also anticipated from the study.

d) Saving Energy:

The reduction of vehicles will manifest in reduced fossil-fuel consumption particularly petrol.

Energy requirement per passenger kilometer is one fifth than for other modes.

e) Extending life of roads:

There will be less strain on the roads and consequently a longer lease of life is ensured to the roads. This will manifest in savings on the state exchequer by reduction in the maintenance demands and expenditure on roads.

f) Noise Reduction :

Due to reduction in the traffic along the corridors, there will be significant reduction in the Noise levels especially in the corridor routes.

g) Socio-Economic Benefits:

By increasing the quality of life on Environmental Factors through the above mentioned benefits and overall positive impact on Society (both direct & indirect) the socio economic benefit is positive and significant. The millions of man-hours saved by travelling public if quantified in terms of money is substantial and noteworthy.

h) Quality of life of citizens improves:

The health of people will be good, because of less air pollution. and reduction of road traffic.

4. Negative impact of Metro rail

Apart from the advantages mentioned above there are a number of problems and disadvantages surrounding it.

- Dust from the construction work causes a lot of breathing problems.
- Very difficult to cross the road while construction, especially for children and senior citizens.
- The Metro Rail construction work affects the business of shopkeepers since customers prefer to shop elsewhere.
- The ongoing construction may be beneficial in the future but while construction the businesses will be affected.
- The metro rail is not suitable for Cargo or goods transportation.
- The road will be more congested along the metro corridors.
- Paucity in availability of land.
- Problems to pedestrians.
- Problems to the residents along the metro corridors as it generate sound pollution and vibrations.
- Land acquisition and rehabilitation of people. The people loose businesses and neighborhoods.
- Many heritage buildings have to be demolished.
- Many public and private properties have to be demolished.
- Many trees have to be cut down along the metro corridor to widen the roads.
- The elevated corridors all along the city will spoil the beauty of the city scape.
- The urban fabric of the city will be changed forever.

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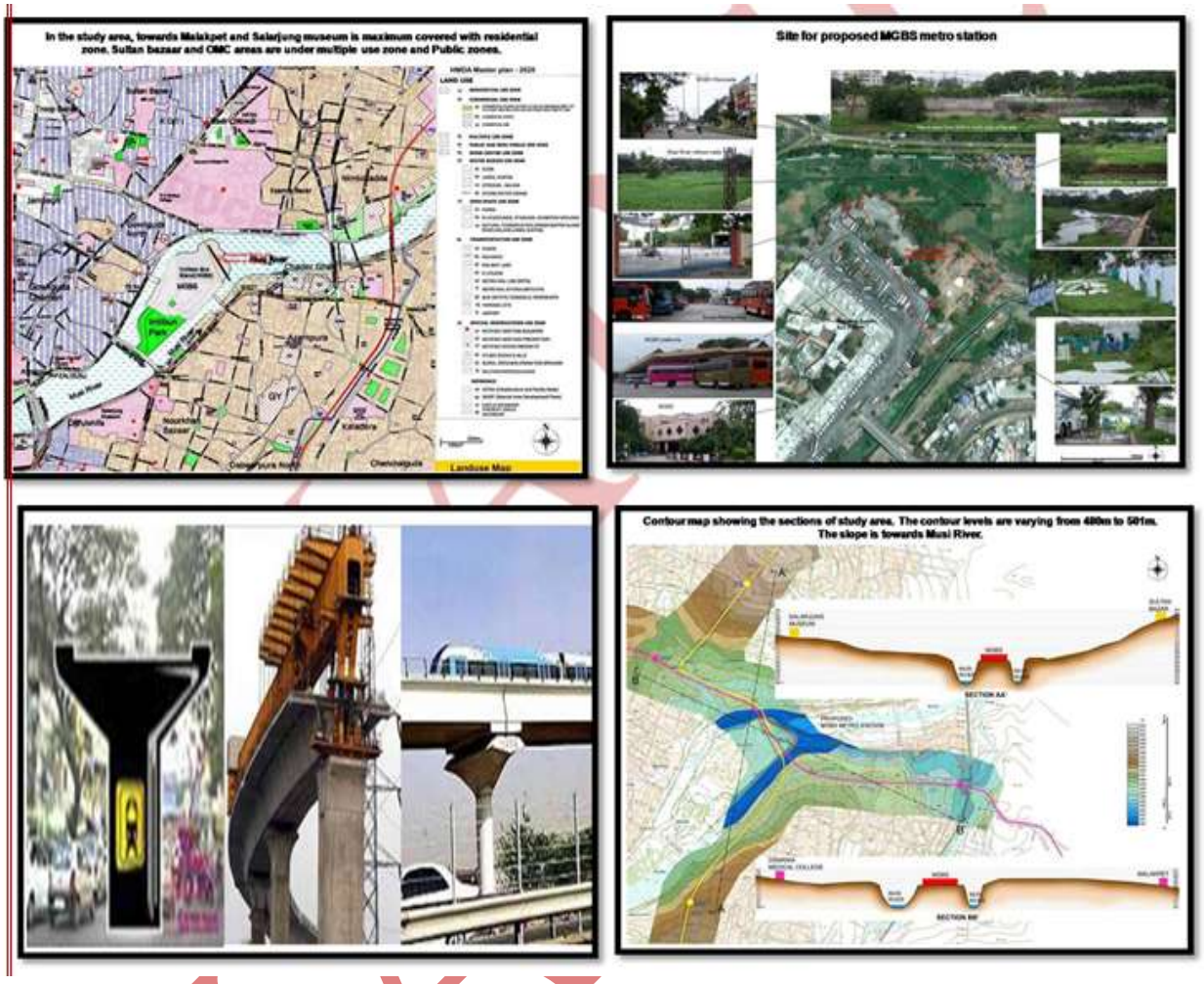

Figures showing metro rail corridors, site location, land use land cover map, satellite imagery with photographs, piers and contour map.