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Potential Assessment of New Metro Station Areas in Lucknow

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Abstract - *In the last few decades, many countries including India invested in public transportation systems as part of infrastructural development in cities. The introduction of metro rails is one of those. It not only brings about a change in the traffic movement pattern but also influences the surrounding land use and land values. The fact is already proven in various studies. It attracts investors for development too. By starting operations of Lucknow metro, a tremendous impact on the existing urban fabric and traffic, especially along the metro corridor is expected. This calls for a change in activity pattern and land-use transformations in areas where development already exists. The primary survey suggests that there is an increased demand for commercial properties along with the new metro stations, particularly near the stations, thereby boosting the land values in these areas may eventually trigger off real-estate activities and may finally bring land-use reforms. From the past evidence, the fact that in such scenarios more un-planned development takes place, cannot be negated. Therefore, planned interventions are the need of the hour. Hence, to make the metro not merely one of many modes of transportation but also to introduce metro as a growth shaper, it becomes essential to explore multi-criteria decision-making tools to foresight the possible development priorities. Therefore, this research aims to draw a picture of development priorities around new metro station areas by analyzing various factors responsible for such changes.*

Key Words: Metro Station Areas; Lucknow; Development Potentials.

1. INTRODUCTION

Land use and transportation system are two mutually interconnected elements in the urban system. These elements are primarily responsible for the dynamic process that involves changes over spatial and temporal dimensions. The location of activities produces transportation demand and on the other hand, transportation supply systems affect the activity locations. Changes in land use system can modify the travel demand patterns and induce changes in transportation systems, which in return, creates new accessibility levels encouraging changes in people's activity patterns [1].

Metro rails are widely accepted as a preferred public transportation option in major metropolitans worldwide. Challenged with the emerging social and environmental problems of urban sprawl, overpopulation, traffic congestion, air pollution, and climate change, an increasing number of Indian cities are taking steps towards the development or expansion of metro rails. Over the past decades, India's ongoing urbanization (governing demand) and economic growth (governing affordability) has allowed more and more cities to meet the requirements to build metro systems [2].

Urban growth and spatial development are quite often governed by the quality and quantity of infrastructure provided. While an inadequate transport facility causes congestion, delay, and hazard which results in significant socio-economic costs to the society. An oversupply, apart from being uneconomical, often is counter-productive to the long-term spatial development strategies of settlements and regions. Supplying and maintaining an optimal level of infrastructure is the key to planned development. India is passing a stage where urbanization is taking place at an increasing rate. With rapid urbanization, there is a widening gap between demand and supply of suitable land use in the already developed urban structure.

The interaction between the development quantum of the urban structure, accessibility, and travel behavior attracted considerable attention in the scientific literature. The interrelation between the rail transport network and land use and the resulting degree of development of urban structure is one of them [3].

There are different views among researchers about the importance of specific land-use characteristics such as high density and mixed-use in metro station areas. Some claim that the presence of a transit station alone can be proven very effective to cater to enormous transformation in that vicinity [4].

Studies show that metro rail operations tremendously affect the land values in station area surroundings. In most cases, these land values inflate promptly in multiples as soon as the station starts functioning or even months before. If development potential is analyzed and projected for such station areas in advance, urban local bodies and development authorities may construct relevant policy measures to embrace positive future growth in these zones. Such developments may be guided through supportive reforms in land use and development guidelines.

2. CITY PROFILE: LUCKNOW

Lucknow is the capital of the country's most populous state of Uttar Pradesh and situated 500km south-east to Delhi, the capital of the nation. The city is an administrative headquarter of state, as well as regional and district, headquarter for Lucknow district itself. It falls under the category of tier II cities and has a great potential to compete for tier I cities, as those cities are approaching towards the urban saturation. Lucknow is also being considered as the next destination for corporate investment in Northern India since Delhi-NCR is overcrowded now.

The most important geographical feature of Lucknow is river Gomti. It flows from north-west to south-east through the heart of the city, dividing it into the Trans-Gomti and Cis-Gomti regions. The densely populated areas of the city are situated on the southern bank of the River Gomti whereas planned residential colonies have been developed to the north of the River. The city is also known for its cultural heritage.

2.1 Demographic Profile

Lucknow Urban Agglomeration became a million-plus city in 1981. Besides the areas under the jurisdiction of the Lucknow Municipal Corporation, the agglomeration also includes the Lucknow Cantonment. Census of India 2011 estimated the population as 32.26 lakhs. In three decades, the city's population has grown more than thrice as it was in 1981. The rapid growth of the population is due to in-migration. This migration is the result of swift development in the real estate market and the intention of the government to attract new corporate investments in the city.

2.2 Socio-Economic Profile

Major functionalities of the city are administrative, educational, and service-based. In past years, the city experienced a rise in retail trades and health services. The real estate market is also facing a rapid transformation due to which Master Plan 2021 anticipates further growth in the services sectors over the next 15 years. The city is also a home for various employment opportunities. The employed (or 'working') population in the city was 28.5% in 2011 whereas the Master Plan 2021 estimates that it may increase up to 30.0% in 2021. Year-wise growth in the working population is shown in Table 1.

Table -1: Workforce in Lucknow city

Percentage of Working Population				
Category	1991	2001	2011	2021
Working	26.51%	27.51%	28.50%	30.00%
Non-Working	73.49%	72.49%	72.49%	70.00%

2.3 Renewal Challenges

The core city area is one of the first to be provided all kinds of infrastructural facilities. This is the reason behind the significant increase in the pressure of the population in inner-city. Increased population is a result of natural increase as well as inner city's pull due to low rents and large numbers of migrant families. The key challenges related to traffic and land use reforms in the inner city are such as encroachments on the roads, urban decay, congestion on roads with mixed traffic conditions & frequent traffic jams at crossings, high parking demands during peak hours, full plot coverages and mixed-use of land.

3. METHODOLOGY

Conversion of residential properties into commercial is happening at an alarming rate particularly in the metropolitan cities of developing nations. Though traffic congestion, parking problems, and air and noise pollution are always being part and parcel in central business districts and primary roads of the metropolitan cities, these evils of unplanned commercial development have trickled down to the main roads of planned housing in various cities [5].

Nowadays, the need for optimum use of land is extremely greater than ever due to rapid population growth and urban expansion which turn land into a relatively scarce commodity. Therefore, an increasing need to match land capabilities and land use in the most rational possible way is essential [6].

From the municipal finance perspective, the choice between a density-oriented approach and a development-oriented approach is a tradeoff between land sector revenue and fare-box revenue [7].

Literature suggests many factors that directly and/or indirectly accelerate the pace of commercial development in station area surroundings. Catchment area, metro ridership, existing land use, densities are few to name. The research work takes the help of already identified factors. Based on these factors, a total of 15 developers in the city were interviewed as experts of the development trends in Lucknow. Developers' opinions were taken into consideration to derive the weights. A total of 9 metro station areas in Lucknow were identified based on developers' opinions, boarding, and alighting footfall forecast data, the population density of surrounding areas, existing surrounding land use, and availability of developable land. A primary questionnaire survey was conducted to collect users' perceptions about the possible development opportunities in these station areas by using the simple random technique. 50 samples were collected for each station area. A comparative analysis is conducted for these station area surroundings. Finally, a development potential matrix is derived.

4. SURVEY RESULTS

All 34 new metro stations were observed during the reconnaissance survey. Through various talks held with real estate developers, investors, and people, out of 34 metro station areas, 9 were found to have strong characteristics and

future scope for commercial developments. Since the study aims to prioritize new metro station areas for commercial development potential, these 9 stations were considered further. Chart-1 shows public opinion regarding upcoming changes due to the metro rail.

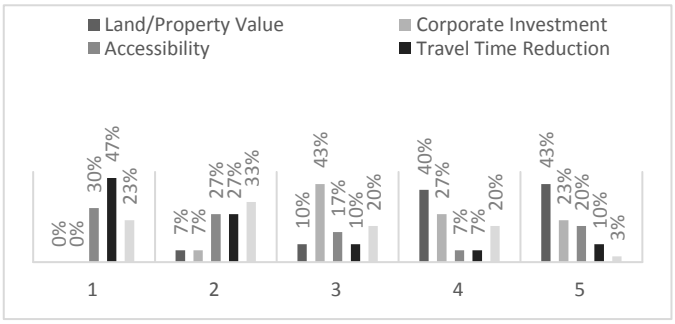

Chart -1: Public opinion regarding upcoming changes

Opinions were taken from a total of 15 real estate experts, developers, and investors to get an idea about probable future growth trends. Preferred locations for commercial developments were found to be in Hazratganj, Mahanagar, and Lekhraj. Apart from preferred locations, the demand for the type of spaces in commercial activities was also inquired. Chart-2 shows the space type requirement choices.

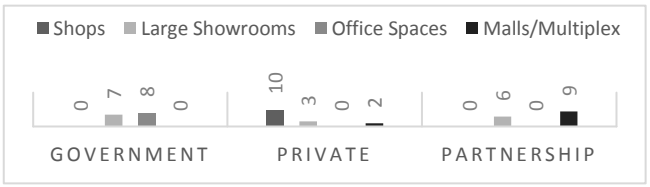

Chart -2: Space type requirement based on primary survey

From collected footfall data, percentage share in peak hour alighting and boarding footfall at every station was calculated to get an idea about the possible upcoming load on new metro station areas. Fig.1 and Fig.2 show the load on station areas due to peak hour boarding and alighting footfall.

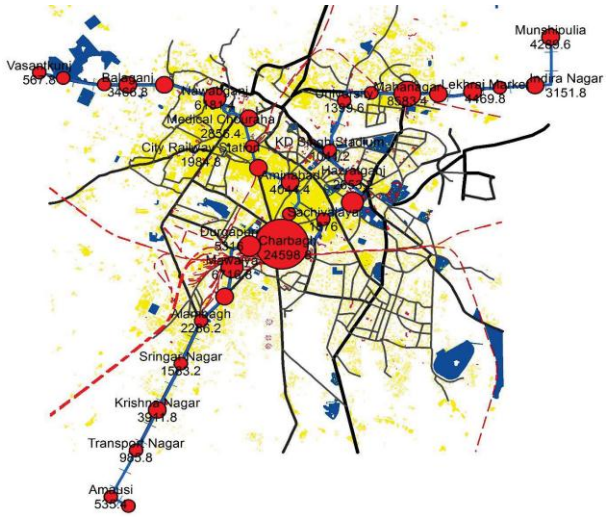

Fig -1: Forecast of Lucknow metro peak hour ridership (Boarding)

Fig -1: Forecast of Lucknow metro peak hour ridership (Alighting)

5. POTENTIAL ANALYSIS

The strategy of development priority zoning (DPZ) with the target of regulating the order of space development and forming a rational structure is taken up in many countries [8].

Development priority indexing (DPi) is a function of the Land Potential Index (LPi) and Land Value Index (LVi). The formulae used have been mentioned below:

DPi = LPi * LVi

5.1 Land Potential Index

A total of nine criteria were considered for calculating Land Potential Index. Each criterion was provided a weightage on a scale of 5 concerning the existing condition in the proposed areas. These criteria were availability of space, existing major land use, availability of residential areas, accessibility from other parts of the city, availability of dilapidated housings, condition of available mixed-use, choice of developers, availability of parking, and existing household density.

5.2 Land Value Index

A similar approach was adopted to derive the LVi in each metro station area. For calculating land value index three major criteria were taken under consideration. Those were circle rates, rental values, and chances of return. On a scale of 5 weights were allotted to the criteria as per the existing conditions in selected areas. Normalized values were calculated, and the final potential indexing is done by using the earlier formula. Table 2 shows the estimated development potential of 9 selected metro station areas.

Table -2: Development potential of selected metro station areas

Development of Potential Values				
Station Name	LPI	LVI	Development Potential	Remarks
Sringar Nagar	0.46	0.92	0.428	Medium
Alambagh Bus Station	0.56	0.60	0.332	Medium
Charbagh	0.68	0.64	0.440	High
Sachivalaya	0.56	0.56	0312	Low
Hazratganj	0.98	0.52	0.508	High
Mahanagar	0.82	0.68	0.560	High
Lekhraj	0.54	0.76	0.404	Medium
Aminabad	0.72	0.68	0.484	High
Medical College	0.46	0.88	0.412	Medium

6. CONCLUSIONS

The results rank the listed station area surroundings based on their potential values. Mahanagar metro station area achieved maximum development potential value i.e. 0.560 whereas Sachivalaya metro station area scored the least i.e. 0.312. The final ranking shows Mahanagar as the most potent station area surrounding to fetch the development in Lucknow. However, in a few station areas like Charbagh and Hazratganj, the influence of metro rail on development is found to be moderate with the potential value of 0.450 and 0.508, respectively.

A detailed analysis of new metro station areas shows their development potentials. It may help planning interventions to shape future growth in these areas. It may be anticipated that the broad guidelines shall have a catalytic effect on the growth of the new metro station areas and may be adopted for the entire corridor. With the help of similar studies, development strategies can be provided to aid planned development and utilize the potential of each station to its fullest. The policies can be framed to help to improve the existing situation and create an integrated structure that would act in harmony with the surroundings.

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