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Study On Impact Of Metro Stations On Residential Land use In Lucknow

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Abstract : The study endeavors to comprehensively examine the influence of transit infrastructure on intermediate stations and surrounding land values in Lucknow, with a specific focus on residential land use and associated urbanization challenges. The research methodology involves a multifaceted approach, beginning with the delineation of the study area to define the geographic scope of the investigation. By precisely demarcating the boundaries, the study can concentrate efforts on the specific areas affected by transit development, facilitating a more targeted analysis. Key issues pertaining to transit impact, such as changes in land values, alterations in land use patterns, and challenges related to urbanization, will be identified and carefully examined. These issues are crucial for understanding the broader implications of transit projects on urban development and can inform policy decisions aimed at managing growth and promoting sustainable development. Data analysis will play a pivotal role in the study, as it will involve gathering and analyzing various datasets related to property values, land use dynamics, demographic trends, and transit ridership. Geographic information systems (GIS) will be utilized to spatially analyses these datasets, allowing for the identification of spatial patterns and relationships between transit infrastructure and land values. A significant component of the study involves conducting a detailed case study on the impact of the metro rail system on nearby residential properties in Gujarat. This case study will employ the Hedonic Price Method, a widely accepted approach for assessing the impact of specific attributes, such as proximity to transit stations, on property values. By applying this method, the study aims to isolate the effect of transit infrastructure on residential property values, providing empirical evidence of its impact. Furthermore, the research will explore post-implementation development strategies, such as transit-oriented development (TOD) and zoning regulations, to capitalize on the opportunities presented by transit investments while addressing potential challenges. Additionally, urbanization challenges, including gentrification and affordability issues, will be identified and analyses to understand the social and economic implications of transit-oriented growth

I. INTRODUCTION

The implementation of a Mass Rapid Transit System (MRTS) or Metro Rail represents a pivotal solution for addressing congestion within expansive urban corridors. By facilitating rapid and efficient transportation, MRTS systems have a profound impact on various aspects of urban life and development. One of the primary benefits is the enhancement of accessibility, particularly in previously inaccessible areas, thereby reshaping travel patterns within the city. Moreover, MRTS infrastructure serves as a catalyst for urban development, stimulating economic growth and investment along its corridors. However, the strategic planning of MRTS hubs is paramount to avoid chaotic urban changes and ensure sustainable development. Without proper foresight, rapid urbanization around MRTS stations can lead to unintended consequences such as congestion and infrastructure strain. Hence, conducting systematic studies to assess the long-term impacts of MRTS operations is essential. These studies should evaluate changes in land use, transportation patterns, and socio-economic dynamics to guide future development in an organized and sustainable manner. Ultimately, while MRTS systems offer significant benefits in terms of accessibility and urban development, proactive planning and monitoring are crucial to mitigate potential negative outcomes and foster a thriving, resilient urban environment.

II. NEED OF THE STUDY & SIGNIFICANCE

Efforts to analyses the effects of transit systems on intermediate stations serve as a cornerstone in urban planning endeavors. The introduction of Metro rail networks can significantly alter the dynamics of land use patterns and property values within urban areas. Urban transportation networks are vital arteries that not only provide essential connectivity for residents but also serve as catalysts for economic growth and social cohesion. By delving into the intricate relationship between transit infrastructure and the surrounding built environment, planners gain insights into how Metro systems shape urban landscapes. This understanding is crucial for devising strategies that harness the benefits of transit while mitigating potential drawbacks such as gentrification, congestion, and displacement, thereby promoting sustainable and equitable urban development.

The transformative potential of transit networks, particularly at intermediate stations, cannot be overstated. These stations often become focal points for commercial and residential development, leading to increased property values and the revitalization of surrounding neighborhoods. However, rapid development around transit hubs can also pose challenges such as affordability concerns and infrastructure strain. Therefore, comprehensive studies are indispensable in evaluating the multifaceted impacts of Metro systems, allowing policymakers to make informed decisions that prioritize the needs of diverse communities and promote

inclusive urban growth. By leveraging transit-oriented development strategies and engaging stakeholders in the planning process, cities can harness the power of transit to create vibrant, resilient, and livable urban environments for present and future generations.

III. AIM

- The aim of this study is to find out the existing empirical methods, to test for the effect of the Metro on residential land use.
- To analyze the impact of density on the transportation corridor load and vice versa.

IV. OBJECTIVES

- To identify and analyse parameters related to functioning of Metro stations with respect to utilization of Land over time.
- To identify quantitative methods and do spatial analysis based on stake holders' perception.
- To propose an efficient and sustainable urban transportation system in areas where metro stations are present.

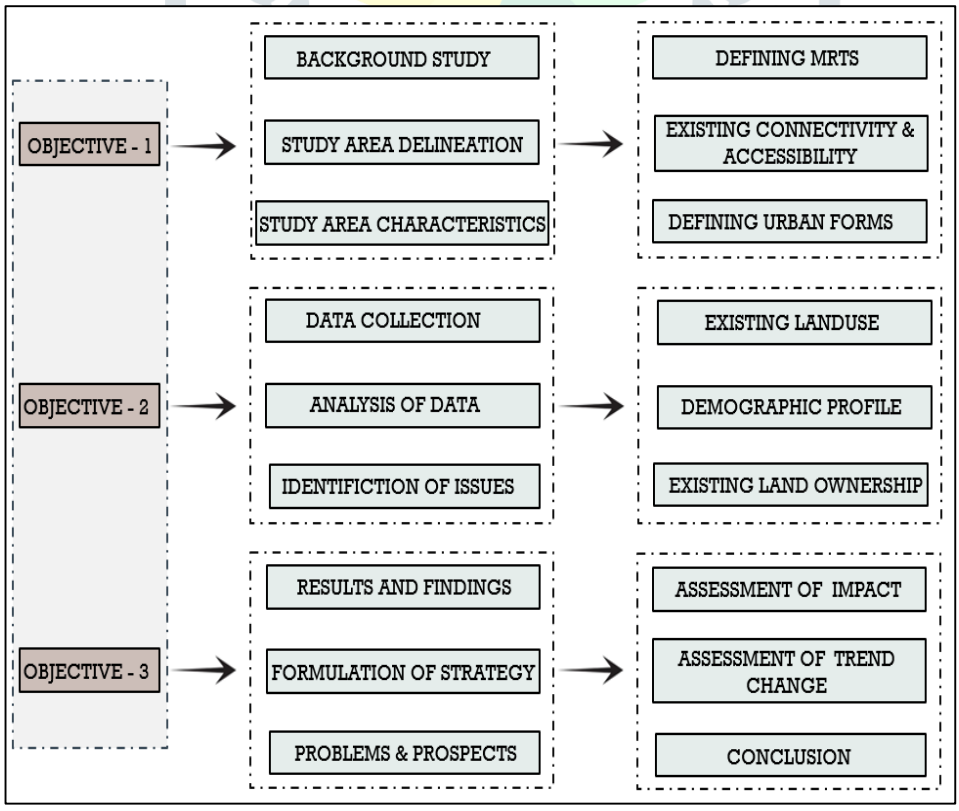
V. SCOPE

- It will provide the picture of impact of a Transit Project on land component of the area as land is the most important component for any development.
- It will also provide the development strategies involved after implementation of Transit Project.
- Challenged with the emerging social and environmental problems of traffic congestion, air pollution, and climate change. 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.

VI. LIMITATION

- Any other land use apart from residential is within the limitations.
- Parameters not relevant to the specific areas of research shall also be considered as limitations of study.
- The study is focused on second order cities like Lucknow.

VII. METHODOLOGY



VIII. LITERATURE STUDY

Literature Study 1

Table 1 Literature 1

Paper Name	Publication	Author	Year
Study on the impact of an urban metro rail project on real estate rental value. Case of Hyderabad metro rail	Malaysian Construction Research Journal	Venu Aravinth Selvaraju	2022

Parameters Of Study

The research work intended to investigate two significant aspects about the impact of metro projects as outlined as -

- To investigate the impact of metro projects on the rental values of properties located in close proximity (< 500 m) distance from the stations.
- To investigate the socio-economic impacts of the metro project development on the tenants in the proximity of metro rail stations.

Inferences

- Because of the metro station, there is an increase in commercial land use and a decrease in residential land use in all of the station influence zones.
- The relationship between residential and commercial land use inside the influence zone is determined to be inversely proportional.
- The study discovered that rental values are greater for properties near metro stations.
- Both Residential and commercial property values are positively impacted by proximity to metro stations.

Literature Study 2

Table 2 Literature 2

Paper Name	Publication	Author	Year
Impact of metro station on surrounding land use Case study of Bangalore Metro Rail Corridor	JETIR(Journal of Emerging Technologies and Innovative Research)	Ar. Anjani Kumar Singh	2014

Parameters Of Study

- Zones 1 (zero to 150 meters), 2 (150 to 250 meters), 3 (250 to 500 meters), and 4 (500 to 1000 meters) make up the four sections of the influence zone that surround the metro station.
- Different types of people are served by different Metro stations; for example, Swami Vivekanand Road is public/semi-public, Halasuru is residential, and Mahatma Gandhi Road (MG Road) is a commercial district.)
- Parameters for Impact Assessment-

  i. Density ii. Transport Network iii. Accessibility
  iv. Land value v. Availability of vacant land vi. Social Infrastructure facilities

Inferences

- In the studied areas, there has been a change in the usage of residential land.
- Because of improved accessibility and rising demand for commercial retail and office space, the residential land use was converted.
- The impact's physical range varies depending on the station (between 500 and 1 km).

IX. CASE STUDY

Case Study 1

Table 3 Case Study 1

Paper Name	Publication	Author	Year
Impact Assessment of MRTS on Land Parameters Case Study of Delhi Metro	IJCRT (International Journal of Creative Research Thoughts)	Ar. Radha Krishan	2022

Parameters Of Study

- In the studied areas, there has been a change in the usage of residential land.
- Because of improved accessibility and rising demand for commercial retail and office space, the residential land use was converted.
- The impact's physical range varies depending on the station (between 500 and 1 km).
- Parameters for Impact Assessment-
  i. Density ii. Land Use
  iii. Accessibility iv. Land value

Inferences

- The analysis demonstrates that the utilization of mixed and residential land has changed. Due to commercialization, residential buildings have been transformed into mixed-use spaces.
- A significant increase in land values close to MRTS.Because of the zone's excellent connection, new business buildings are being built on the zone's vacant lots.
- The impact's physical range varies depending on the station (from 500m to 1.5 Km around)

Land-use	2001 Area(sq.km.)	%age	2014 Area(sq.km.)	%age	± change of %age
Residential	1.73	66.43	1.27	48.82	-17.61
Commercial	0.30	12.38	0.53	20.38	8.00
Institutional	0.10	4.40	0.31	12.05	7.65
Mixed Use	0.13	5.26	0.26	10.17	4.91
Open	0.34	13.75	0.21	8.38	-5.37

Figure 2 Comparative Analysis of Land-use Of Study Area (2001/ 2014)

BUILDING HEIGHT	2001 area (sq.km.)	%age of study area	2014 area (sq.km.)	%age of study area	± %age change
OPEN	0.34	13.75	0.24	9.38	-4.37
6.0 meters	0.047	1.81	0.047	1.81	nil
9.0 meters	2.11	81.10	1.982	76.20	-4.9
12.0 meters	0.090	3.48	0.215	8.28	4.8
15.0 meters	0.011	0.43	0.089	3.43	3.0
21.0 meters	0.015	0.59	0.00	0.00	-0.59
33.0 meters	--	--	0.0033	0.13	0.13
65.0 meters	--	--	0.020	0.77	0.77
TOTAL	2.60	100	2.60	100	

Figure 3 Analysis Chart of Building Heights In (2001/ 2014)

Case Study 2

Table 4 Case Study 2

Paper Name	Publication	Author	Year
Impact of Metro Rail Project on Nearby Residential Properties in Gujarat	International Research Journal of Engineering and Technology (IRJET)	Vishal A. Patel	2021

Parameters Of Study

- The main goals of the research are to ascertain how the metro rail system affects the value of neighboring residential properties and to examine trends in the prices of real estate close to metro areas.
- •The main locations for data collecting were Surat and Ahmedabad, specifically the Rupali Canal Junction in Surat and the VIP Road Junction in Ahmedabad, where metro construction had begun.
- These locations were divided into three sections, such as 0-0.5km, 0.5-1.0km, and 1.0-1.5km, to examine their proximity to the station.
- Parameters: Depending on the distance, prices will vary before and after the proposal and completion of the metro.

Inferences

- The value of neighbouring residential properties is significantly impacted by the metro train system.
- The main elements influencing property valuation are location, last mile connectivity, accessibility enhancements brought about by the metro, and distance from the metro station.
- The metro's surrounding criminal activity, the new development it has spurred in the surrounding neighborhoods, the inconvenience it has caused owing to traffic congestion, and the parking facilities it offers at metro stations are some of the qualities that have both positive and negative effects.

Method of analyzing data – (Hedonic Method)

- Hedonic Price Method basically used to find out the value of the properties with respect to different attributes from this method we find out the which factor was mainly affected the price fluctuation at that location and find out the attributes which gave an impact on the valuation.
- For example,
- P = (Loc, Str, Acc, Env, Nei)
- Where; **P** is the price of a property
- **Loc** is the location characteristics, i.e., urban, rural, distance from the city Centre, etc.
- **Str** is the structure of the property, i.e., number and size of rooms, size of the stand, property age, etc.
- **Acc** is the accessibility of the property, i.e., proximity to social amenities, public transport accessibility, etc.
- **Env** is the environmental quality, i.e., quality of air, quality of water, etc.
- **Nei** is the neighborhood characteristics, i.e., crime rate, scenic views, quality of schools, etc.

According to the Hedonic Price Model analysis, the collected data can be divided into three groups: low-income households, medium-income households, and high-income households. It can also be divided into three groups based on the house's size and income: 0.0-0.5 kilometers, 0.5-1.0 kilometers, and 1.0-1.5 kilometers.

REFERENCES

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[3] (Impact Assessment of MRTS on Land Parameters Case of delhi metro, 2022)
[4] (Impact of Metro Rail Project on Nearby Residential Properties in Gujarat, 2021)