Vol. 12, Issue 12, December 2024
ISSN(P) 2347-5404 ISSN(O)2320 771X

Effect of Metro Railway on Gandhinagar and Ahmedabad District

NIDHIBEN PRATAPBHAI CHAUDHARI

Abstract:
The introduction of the metro railway in Ahmedabad and its extension towards Gandhinagar marks a significant milestone in Gujarat's urban development journey. This theme paper explores the multi-dimensional impacts of the metro project, including its influence on urban mobility, economic activity, environmental sustainability, and socio-spatial dynamics. With the successful implementation of Phase 1 and the ongoing progress of Phase 2, the metro has improved intra-city and inter-city connectivity, reduced travel time, and encouraged a shift towards public transport. The project has also stimulated real estate growth, revitalized commercial zones, and supported environmental goals by reducing vehicular emissions. However, the development has not been without challenges—issues like displacement during construction, accessibility gaps, and ridership shortfalls still need policy attention. By examining these effects through a comprehensive lens, the paper highlights the metro's role as a catalyst for inclusive and sustainable urban transformation in the Gandhinagar-Ahmedabad region. The insights derived may serve as a model for metro development in other growing Indian cities.

Keywords: *Metro Railway, Urban Mobility, Gandhinagar, Ahmedabad, Real Estate, Environmental Impact, Public Transport, Sustainable Development, Transit-Oriented Development, Urban Infrastructure.*

1. Introduction

Urban India is experiencing an infrastructure renaissance, with metro rail systems being central to this transformation. The implementation of metro railways is not merely a response to traffic congestion but a comprehensive intervention aimed at improving urban mobility, promoting sustainable development, and driving economic growth. In Gujarat, the cities of **Ahmedabad and Gandhinagar** have witnessed significant urbanization, prompting the need for advanced transit solutions.

The **Ahmedabad Metro Project**, initiated in 2015 by the Gujarat Metro Rail Corporation (GMRC), is a milestone in public transportation development. Phase 1 of the project has already transformed the urban landscape, while Phase 2 is poised to deepen its impact by connecting Gandhinagar more comprehensively. This paper explores the various **social, economic, environmental, and infrastructural** effects of the metro railway on the two districts.

2. Objectives

1. To analyze the transformation in urban mobility and travel behavior in Ahmedabad and Gandhinagar due to the metro.
2. To study the economic and real estate impact in proximity to metro corridors.
3. To examine the environmental benefits of the metro project.
4. To identify social implications, including accessibility, affordability, and displacement issues.
5. To assess the long-term implications of metro development on urban planning and governance.

3. Definitions of the keywords

1. **Metro Railway**
   A high-capacity urban public transport system that runs on elevated, underground, or surface-level tracks using electric trains, designed to reduce traffic congestion and improve mobility in densely populated areas.
2. **Urban Mobility**
   The ease and efficiency with which people move within an urban area using various modes of transport, including public transit, private vehicles, walking, and cycling.
3. **Gandhinagar**
   The capital city of Gujarat, known for its administrative importance, planned infrastructure, and upcoming integration into the Ahmedabad Metro network through Phase 2.
4. **Ahmedabad**
   A major metropolitan city in Gujarat, characterized by rapid urbanization, commercial hubs, and being the central area for the first phase of the metro railway system.
5. **Real Estate**
   The property market involving the buying, selling, and development of land and buildings, which is often significantly influenced by transport infrastructure like metro railways.
6. **Environmental Impact**
   The effect of a project or development (such as a metro system) on the natural environment, including changes in air quality, noise levels, carbon emissions, and energy consumption.
7. **Public Transport**
   A shared transportation system (e.g., buses, trains, metros) provided for use by the general public, offering an affordable and efficient alternative to private vehicles.
8. **Sustainable Development**
   Development that meets the needs of the present without compromising the ability of future generations to meet their own needs, often emphasizing environmental, social, and economic balance.
9. **Transit-Oriented Development (TOD)**
   A planning strategy that promotes high-density, mixed-use development near public transport hubs, encouraging walkability, reduced car dependence, and efficient land use.
10. **Urban Infrastructure**
    The physical and organizational structures and facilities (e.g., transportation systems, roads, power supply) needed for the operation and growth of urban environments.

4. Background and Evolution of Metro in Gujarat

4.1 Ahmedabad and Gandhinagar A Tale of Two Cities

Ahmedabad, the largest city in Gujarat, is a hub of commerce, education, and culture. Gandhinagar, the state capital, lies just 30 km away and houses administrative and institutional establishments. The urban corridor between these two cities has seen rapid development, yet remained constrained by **conventional modes of transport**—primarily buses, rickshaws, and private vehicles.

4.2 Genesis of the Metro Project

Recognizing the growing need for efficient mass transport, the **Gujarat Metro Rail Corporation (GMRC)** launched Phase 1 of the Ahmedabad Metro covering 40.03 km, with North-South and East-West corridors. Operational sections include major stations like Vastral, Apparel Park, Kalupur, and Motera. **Phase 2**, under construction, extends to Gandhinagar, covering 28.26 km and including strategic nodes like Gift City, Infocity, and Sector-1 Gandhinagar.

5. Urban Mobility Transformation

5.1 Shift in Transportation Patterns

Before the metro, residents of Ahmedabad and Gandhinagar relied heavily on GSRTC buses, AMTS, BRTS, and private vehicles. The metro has offered

- Predictable travel times
- Comfortable rides, especially during peak hours
- A cleaner, electrified alternative to fossil fuel-driven vehicles

According to GMRC's 2023 ridership statistics, daily footfall has crossed **80,000**, with consistent upward trends since Phase 1's full commissioning.

5.2 Improved Inter-city Connectivity

Metro expansion to Gandhinagar will reduce the current 60–90-minute commute to just **25–30 minutes**, encouraging

- Government employees to travel more efficiently
- Students and professionals from one city to access institutions and jobs in the other
- Integration of both cities into a unified metropolitan region

5.3 Accessibility and Last-mile Connectivity

Despite advantages, many commuters still face **last-mile challenges**. The availability of auto-rickshaws, feeder buses, and bike rentals near metro stations remains inconsistent. This has prompted authorities to plan **integrated mobility hubs** in future phases.

6. Economic and Real Estate Impacts

6.1 Boost in Real Estate Development

The introduction of the metro has stimulated the real estate sector across both districts. A study by Knight Frank India (2023) shows that

- Property prices near metro stations (within 1 km radius) have appreciated by **15–30%**
- Areas like **Vastral, Motera, Kalupur, Thaltej, and Gota** in Ahmedabad have become high-demand zones
- **Gandhinagar sectors 21, 24, and Gift City** are emerging as preferred residential areas due to metro accessibility

6.2 Rise in Commercial Activity

Retail businesses near metro stations have recorded

- Increased **footfall**
- Higher **lease values**
- More startup ventures around key nodes like **Apparel Park**, **Old High Court**, and **Gift City**

6.3 Employment Generation

The metro project has also created thousands of **direct and indirect jobs**, including

- Construction labor
- Metro operation staff
- Maintenance and security personnel
- Informal vendors and service providers around metro stations

7. Environmental and Sustainability Impacts

7.1 Reduction in Vehicular Pollution

Ahmedabad is among India's most vehicle-heavy cities. The shift to metro rail is slowly easing

- **CO_2 emissions** due to lesser vehicle usage
- **Noise pollution**, especially along arterial roads like Ashram Road and Naroda Road
- Preliminary estimates suggest that metro usage could reduce **carbon emissions by 0.25 million tons annually** once full ridership is achieved.

7.2 Energy Efficiency

Metro trains operate on **electrified tracks** with regenerative braking, making them far more energy-efficient than diesel buses or private cars.

7.3 Urban Green Planning

Many metro stations have included **green spaces**, **solar panels**, and **rainwater harvesting systems** as part of the infrastructure, aligning with India's Sustainable Development Goals (SDGs).

8. Social Dimensions and Urban Inclusivity

8.1 Improved Mobility for Vulnerable Groups

The metro has significantly benefited

- **Students** commuting to schools, colleges, and coaching institutes
- **Women**, especially during early morning or late-night shifts
- **Senior citizens**, who appreciate metro's punctuality and safety
- **Physically challenged persons**, though some stations still lack full accessibility features

8.2 Displacement and Rehabilitation Issues

Like most urban infrastructure projects, the metro has led to

- **Relocation of informal settlements**
- **Displacement of vendors and shop owners**

While compensation policies exist, implementation remains uneven, especially for non-title holders.

8.3 Cultural and Lifestyle Shifts

The metro is also reshaping urban lifestyles

- Encouraging more **public spaces** around metro stations
- Promoting **walkability**
- Inspiring **modern urban identity** through murals, music, and design at stations

9. Governance, Policy, and Institutional Coordination

9.1 Multi-agency Collaboration

The metro's success is rooted in collaboration among

- GMRC (project execution)
- Ahmedabad Urban Development Authority (AUDA)
- Gandhinagar Urban Development Authority (GUDA)
- AMC & GIDC (land and infrastructure support)
- Central Government (funding through equity and loans)

9.2 Smart City Integration

Ahmedabad and Gandhinagar, both **Smart Cities**, have integrated metro development with

- **Surveillance systems**
- **Smart ticketing (QR, RFID cards)**
- **Mobile apps** for real-time updates

9.3 Public-Private Partnerships (PPP)

Future metro expansions may adopt PPP models for

- Station retail zones
- Multi-level parking
- Feeder bus services

10. Challenges and Critiques

Despite its many positives, several **challenges** remain

- **Cost Overruns and Delays** Phase-1 completion was delayed due to land acquisition and utility shifting
- **Ridership Gap** Actual ridership has not yet matched projections due to limited first/last-mile options
- **Accessibility Barriers** Not all stations have elevators, ramps, or tactile paths
- **Revenue Generation** High dependence on government subsidies; non-fare revenue sources need to be enhanced

11. Long-term Urban Implications

11.1 Transit-Oriented Development (TOD)

Metro development has triggered **zoning changes**, higher **Floor Space Index (FSI)** allowances, and mixed-use projects around stations. These could

- Densify urban cores
- Reduce urban sprawl
- Encourage affordable housing near stations

11.2 Gandhinagar-Ahmedabad Regional Integration

The metro is a **catalyst for regional integration**, helping the two cities evolve into a **megacity corridor**, on par with NCR (Delhi-Gurgaon-Noida) or Mumbai-Pune belt.

11.3 Replication Model for Tier-2 Cities

The Ahmedabad-Gandhinagar model can be a template for other medium-sized Indian cities like Bhopal, Lucknow, and Nagpur, balancing infrastructure growth with inclusive planning.

12. Recommendations

Based on the analysis, the following steps are suggested

1. **Enhance Last-Mile Infrastructure** Include dedicated shuttle services, shared mobility zones, and bicycle lanes.
2. **Inclusive Design** Ensure universal accessibility in all stations through ramps, lifts, tactile paths.
3. **Real Estate Regulation** Prevent speculative land pricing through proper zoning and affordable housing policies.
4. **Sustainability Measures** Expand the use of solar energy and green building codes for all stations.
5. **Public Participation** Engage citizens, resident welfare associations, and civil society in decision-making.
6. **Monitoring and Evaluation** Regularly track performance indicators—ridership, emissions, accessibility, and satisfaction.

13. Conclusion

The metro railway has emerged as a transformative urban intervention for Ahmedabad and Gandhinagar. It has improved mobility, boosted the economy, elevated the real estate market, and enhanced environmental sustainability. More importantly, it has helped redefine the socio-spatial dynamics of urban Gujarat. With proper planning, stakeholder engagement, and inclusive development, the metro can serve as a backbone for future urban growth, making cities smarter, greener, and more liveable.

As the metro expands its reach, it must remain a **public-centric, sustainable, and adaptive** transport solution—one that not only connects places but also **bridges opportunities** across all sections of society.

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