Integrating Urban Planning and Transportation Policies for Climate Resilience: The Role of Bus Rapid Transit Systems (BRTS) in Gujarat

Raut Nileshkumar Kailashbhai

Research Scholar

Department of Commerce

ORCID ID: 0009-0005-5281-7164

Veer Narmad South Gujarat University, Surat

Email Id: nileshraut571998@gmail.com

Dr. Mehul Maheshbhai Mistry

Assistant Professor

P.R.B Arts & P.G.R Commerce College, Bardoli

Email Id: mehul_mistry11@yahoo.co.in

Abstract:

Challenges urbanized India's transportation systems because of climate change and rapid urbanization are unparalleled. Integrating urban planning and transportation policies is vital for building climate-resilient systems. Bus Rapid Transit Systems (BRTS) are Indian sustainable transit systems that have been implemented in cities such as Surat and Ahmedabad that have a goal of decreasing emissions, enhancing mobility, and improving livability in cities.

This research looks at the extent to which BRTS in Gujarat supports the goals of urban planning and climate resilience. With the help of a qualitative comparative case study, this research examines the planning systems, the effectiveness of the systems in operations, and the extent to which policies have been embedded in Surat and Ahmedabad. The results show the corridors, transit-oriented development (TOD), and the varying forms of mobility have been successful in both cities to a large extent. However, the results show that there is a major failure in the long-term responsive integration of land, environment, and transport. This paper suggests that harmonized planning of both urban and transport systems along the adoption of renewables and institutional restructuring/reforming can significantly bolster India's climate resilience.

Introduction:

Among the most vulnerable areas affected by climate change are urban centers because of their high density of population, traffic, and consumption of resources. Indian cities are currently under great pressure to reconcile fast-paced growth with ecological concerns. It is estimated that the transport industry accounts for about 13% of the overall carbon emissions related to energy use in India (NITI Aayog, 2021). Therefore, the need to develop resilient and integrated transportation systems has become a matter of national and urban concern.

Bus Rapid Transit Systems (BRTS) have emerged to be one of the greatest policy decisions taken in India for promoting sustainable transport. These are designed for provision of quality, efficient, and affordable means of public transport that will encourage people to leave cars and switch to public transport. Gujarat stands out as the leader in implementation of BRTS projects, and Ahmedabad was the first city to implement Janmarg in 2009, while Surat Sitilink BRTS became operational in 2014.

Both systems have been established under the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) and have received recognition from international organizations like the Institute for Transportation and Development Policy (ITDP) for their efforts towards sustainable mobility. Apart from transportation aspects, BRTS will help India in its goals in the Paris Climate Agreement, SDG 11 (Sustainable Cities and Communities), and Viksit Bharat 2047.

There is need for the integration of urban planning and transportation policies in making BRTS more resilient to climate change. This involves aspects of land use integration, green corridors, energy efficiency, and climate-proofing of infrastructure. This research project is focused on finding out how Gujarat BRTS network fits into all this and the policy measures that should be taken.

Review of Literature:

(Cervero & Dai (2014) Investigated the connection between TOD and climate mitigation, showing how the combination of urban land use and transport planning helps reduce vehicular emissions by 30%.

(Rizvi & Sclar, 2015) Demonstrated that BRTS systems can be considered sustainable means of transport only if urban governance and planning mechanisms operate effectively.
Mittal & Sharma (2018) Examined Indian urban transport problems and discussed the effectiveness of BRTS as an economical replacement for metros in the secondary tier cities with substantial capacity to cut down emissions.

(Patel, 2019) Carried out a comparative analysis of Ahmedabad and Pune BRTS and concluded that the factors of policy integration and coordination within the institutions were much more important for success than infrastructure building.

(Kumar & Singh, 2020) Found that the key to climate-resilient urban mobility was energy-efficient infrastructure, electric vehicles integration, and coherent public policies within urban planning departments.

(ITDP, 2020) States that Ahmedabad BRTS has helped cut down almost 38,000 tonnes of CO_2 emissions per year through the reduction of private vehicles and use of public transport, indicating a direct benefit to the environment.

(Desai & Bhatt, 2021) Conducted an analysis of socio-economic benefits of Surat BRTS and concluded that there was a positive effect on accessibility of disadvantaged commuters along with sustainable urban development.

(World Bank, 2022) Points out that sustainable transport helps in building city resilience as it helps reduce environmental vulnerability and compact growth.

(UN-Habitat, 2022) Reiterates the need for coordination between transport and land-use policies to avoid urban sprawl and develop adaptive capacity to face adverse climatic conditions.

(Mehta & Pandya, 2023) Examined the issue of fragmented institutions in Indian transport governance and emphasized the establishment of integrated metropolitan transport authorities.

Objectives of the Study:

1. To analyze how far urban planning and transport policies have been integrated for developing climate resilience by using BRTS in Gujarat.
2. To analyze how policies for Surat and Ahmedabad BRTS have been developed for achieving sustainable urban mobility.

Research Methodology:

The research methodology adopted in this study is comparative case study research methodology. The case studies are Surat and Ahmedabad BRTS which are representative examples of integrated urban transport systems in Gujarat.

Data Collection

Secondary Data: Policy documents, BRTS annual reports, ITDP publications, and urban planning guidelines from the Ministry of Housing and Urban Affairs (MoHUA).

Scope and Limitations of this study

The study focuses on two cities—Ahmedabad and Surat—representing mature and developing BRTS models respectively. It does not include financial analysis or passenger satisfaction surveys in detail but emphasizes urban-planning linkages and climate policy integration.

Overview of BRTS in Gujarat:

Ahmedabad Janmarg BRTS, started functioning since 2009, spans over 162+ km route length and transports approximately 1.5 lakh commuters per day (AJL Report, 2023). The concept of TOD was kept in mind while designing the network, which includes linking transportation corridors with land-use planning, affordable housing, and commercial projects. On the other hand, Surat Sitilink BRTS, established in 2014 and run by Surat Municipal Corporation (SMC) and Surat Sitilink Limited (SSL), has currently covered 125 km with around 1.1 lakh passengers per day (SMC Annual Mobility Report, 2023). It is a major part of the CMP of Surat that connects transport planning with environmental management and flood protection.

Table 1: Comparative Overview of Ahmedabad and Surat BRTS

Parameter	Ahmedabad Janmarg	Surat Sitilink
Year of Launch	2009	2014
Operational Length (km)	162	125
Daily Ridership (approx.)	1.5 lakh	1.1 lakh
Implementing Agency	Ahmedabad Janmarg Ltd. (AJL)	Surat Sitilink Ltd. (SSL)
Carbon Emission Reduction (tonnes/year)	38,000	27,500
Renewable Energy Integration	Partial (Solar lights, e-ticketing)	Pilot solar charging for e-buses
TOD Implementation	Strong (Integrated zoning)	Moderate (Pilot phase)
Climate Adaptation Focus	Flood resilience & heat mitigation corridors	Waterlogging & coastal flood planning
Urban Governance Coordination	AMC, AUDA, AJL	SMC, SUDP, SSL

Source: ITDP (2023), SMC Mobility Report (2023), AJL Annual Report (2023)

Figure 1: Ahmedabad Janmarg



(Source: The Times of India)

Figure 2: Surat Sitilink



(Source: Divya Bhaskar)

Integration of Urban Planning and Transport Policy:

Integration of urban planning and transport policies in both Ahmedabad and Surat BRTS systems is informed by NUTP and Smart Cities mission. In Ahmedabad, there is a high level of coordination between land use and transportation infrastructure. This is because the Janmarg BRTS corridors are located close to the high density residential and commercial zones, promoting compactness and minimizing travel demand.

Conversely, the Surat BRTS project represents an integration that is still being developed. In this case, the integration strategy focuses on the provision of infrastructural facilities and urban development. SUDA and Surat Municipal Corporation have worked together to incorporate the BRTS corridors in the flood prevention and environmental sustainability strategy of the city.

BRTS has been integrated in both cities' Comprehensive Mobility Plans (CMPs) to facilitate multimodal connectivity with auto-rickshaws, walking, and cycling infrastructure. Nevertheless, Surat lacks behind in terms of enforcement of land use and transit-oriented zoning.

Climate Resilience and Environmental Impact:

The BRTS is important in climate resilience through reducing GHG emissions, mitigating vehicle congestion, and building adaptive capacity. The BRTS in Ahmedabad, for example, is estimated to reduce GHG emissions of 38,000 tonnes of CO_2 per year, while that in Surat saves an estimate of 27,500 tonnes of CO_2 per year.

Also, both the cities have incorporated electric and CNG fuelled buses to enhance energy efficiency. Ahmedabad has launched solar-powered ticketing booths and corridors of LED lights, while Surat has launched pilot solar charging stations for e-buses.

See Figure 1 below for the trend of GHG emission reductions estimated from the above information.

Figure 1: Estimated CO_2 Emission Reduction (2014–2023)

Year	Ahmedabad (Tonnes/Year)	Surat (Tonnes/Year)
2014	12,000	5,000
2016	20,000	9,500
2018	27,000	15,500
2020	33,000	22,000
2023	38,000	27,500

(Source: Compiled from ITDP, AJL, and SMC Reports 2023)

Institutional and Policy Coordination:

Successful implementation of the BRTS is reliant upon institutional coordination. The city of Ahmedabad has the advantage of having a coordinated governance structure where the management of the project is coordinated through Ahmedabad Janmarg Limited (AJL) that is jointly owned by AMC and AUDA.

Surat works through the Surat Sitilink Limited (SSL), which has jurisdictional overlaps in terms of the SMC, SUDA, and SITCO. This can sometimes delay coordination of transportation policy with climate adaptation measures especially in areas prone to seasonal flooding.

Nevertheless, both BRTS initiatives have become increasingly inclined to the Integrated Urban Transport Planning Approach in line with AMRUT and NCAP.

Policy Integration with Urban Resilience Frameworks:

Gujarat's urban resilience approach includes risk-aware land use, green infrastructure, and efficient mobility. The Ahmedabad Climate Action Plan (2022) includes the integration of BRTS with its low-carbon transport system. Heat island effect is reduced in this city by tree plantations in corridors and climate-resilient bus stations.

The Surat Resilience Strategy (2019), developed under the 100 Resilient Cities Program, incorporates the connection between BRTS and flood-prone areas, to keep access during climate events. BRTS routes in Surat have raised platforms and drainage facility.

The two examples above provide the need to connect transportation systems with climate-resilient infrastructures.

Findings and Suggestions:

Key Findings

- Policy Consistency: The BRTS systems in Ahmedabad and Surat have been included in various national initiatives such as the NUTP, the Smart Cities Mission and the Climate Action Plan and they promote SDG 11 and SDG 13.
- Good Impact on the Environment: The two BRTS systems have both contributed to a reduction in the level of CO2 emissions and congestion in the cities.
- Limited Urban Integration: In Ahmedabad there is a higher degree of coordination between land use planning and BRTS systems than in Surat, where the integration is based on individual projects.
- Institutional Complexity: Progress has been made regarding policy, but the complexity of the institutional structure, with overlapping roles among the various organizations, has hindered the decision-making process in Surat when compared to that in Ahmedabad.
- Designing systems with a view to the climate: In both of these approaches there is a need for improvements regarding green corridors, the use of renewable energy, and design of climate-sensitive infrastructure.

Suggestions

- The adoption of comprehensive TOD concepts: Combine the BRTS with land-use planning, affordable housing, and the creation of a walkable environment in order to promote compact cities.
- Promoting the use of renewable energy: Within the BRTS corridors, increase the number of e-bus charging stations that use solar power and those that use LED lighting.
- Institutional Consolidation: Setting up UMTRs in order to enhance decision-making by various urban agencies. Climate-Proof Infrastructure. Create flood-resistant bus stops, install stormwater drainage along BRTS corridors, and establish tree-lined routes as a measure for heat mitigation.
- Involving the public and raising awareness: We should encourage people to take part in the planning and monitoring of urban transport projects in order to improve resilience and ensure accountability.

Conclusion:

The research shows that combining urban planning with transport policy is essential if Indian cities are to become resilient to the effects of climate change. When the performance of Surat's and Ahmedabad's BRTS systems is compared, it is evident that both transport systems have achieved important progress in terms of sustainable development, reduced emissions, and improved accessibility. The example of Ahmedabad's BRTS illustrates a well-developed model of transit-oriented and integrated planning, while that of Surat's BRTS indicates a growing tendency towards innovative solutions in resilience-oriented planning. Nevertheless, there is still scope for greater collaboration between agencies, for incorporating renewable energy resources, and for better synchronizing land use. In order to achieve the objectives of Viksit Bharat 2047 and the Net Zero 2070 target, India should treat BRTS as a powerful means of creating low-carbon, inclusive and resilient cities.

References:

- Ahmedabad Janmarg Limited. (2023). *Annual performance report*. Ahmedabad Municipal Corporation.
- Cervero, R., & Dai, D. (2014). *BRT and transit-oriented development: Expanding mobility and climate resilience*. Transport Policy, 35, 54–66.
- Desai, P., & Bhatt, K. (2021). Socio-economic impacts of Surat BRTS: Inclusive urban mobility in Gujarat. Indian Journal of Urban Studies, 9(3), 112–128.
- Institute for Transportation and Development Policy (ITDP). (2020). The BRTS impact in India: A sustainability assessment. ITDP India Programme.
- Institute for Transportation and Development Policy (ITDP). (2023). Low-carbon transport systems: Case studies from Indian cities.
- Kumar, A., & Singh, R. (2020). Energy efficiency and climate resilience in urban mobility planning. Sustainable Cities Journal, 14(2), 77–94.
- Mehta, D., & Pandya, N. (2023). Institutional reforms for integrated urban transport governance in India. Journal of Infrastructure Policy, 11(1), 66–82.
- Mittal, P., & Sharma, N. (2018). Urban transport and emission reduction in India: The role of BRTS. Journal of Sustainable Infrastructure, 6(4), 215–232.
- NITI Aayog. (2021). Decarbonizing India’s transport sector: Pathways and opportunities. Government of India.
- Patel, J. (2019). Policy integration and success factors of BRTS in Indian cities: A comparative approach. Urban Policy Review, 8(2), 134–150.

- Rizvi, A., & Sclar, E. (2015). Integrating BRTS and urban governance for sustainable development. Transport and Society, 19(3), 188–202.
- SMC. (2023). Surat Comprehensive Mobility and Resilience Report. Surat Municipal Corporation.
- UN-Habitat. (2022). Planning for climate-resilient cities: Integrating land use and transport. United Nations Human Settlements Programme.
- World Bank. (2022). Resilient urban transport and sustainable development. World Bank Urban Development Series.
- World Resources Institute (WRI). (2021). Electric mobility transition in India's public transport. WRI India.
- Surat Sitilink Limited. (2023). Performance overview and emission reduction data. Surat Municipal Corporation.
- Ministry of Housing and Urban Affairs (MoHUA). (2022). National Urban Transport Policy Guidelines. Government of India.
- Gujarat Urban Development Department. (2021). Climate action and sustainable mobility roadmap. Gandhinagar.
- BRTS India. (2023). A decade of bus rapid transit in India: Lessons and best practices. Ministry of Urban Development.
- World Economic Forum. (2022). Climate-resilient infrastructure: The urban transport perspective.
- Vansiya, Y. N. (2013). *Tourism development in Gujarat: With special reference to The Dangs District* (1st ed.). Vishleshan Trust. ISBN 978-81-922107-2-8