Traffic Congestion Problems in Small Indian Cities: A Case Study of Agartala

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Abstract

Traffic congestion, once considered a malady of Tier-1 Indian metropolises, has increasingly permeated Tier-3 cities, presenting a complex challenge for urban administrators. This paper investigates the specific traffic dynamics of Agartala, the second-largest city in Northeast India. Characterized by a "border-locked" geography and a historical "Chowmuhani" (intersection) culture, Agartala's urban core is buckling under the weight of rapid motorization. This study employs a mixed-methods approach, utilizing traffic volume counts at major nodes, "roadside friction" analysis, and a review of the impact of the Smart City Mission. The research identifies three primary drivers of congestion: the uncontrolled proliferation of e-rickshaws (Totos), the lack of off-street parking, and the "funnel effect" caused by narrow arterial roads leading into major junctions like Battala and Paradise Chowmuhani.

Data reveals that the Passenger Car Unit (PCU) values are heavily skewed by paratransit, which accounts for over 30% of the traffic volume but contributes to nearly 60% of the "turbulence" in flow. Furthermore, the study examines the Adaptive Traffic Control System (ATCS) implemented under the Smart City initiative, finding that while technology has optimized junction timing, the lack of physical road space remains a hard bottleneck. The paper quantifies the environmental and economic costs, estimating that commuters in Agartala lose approximately 40 minutes daily to congestion-related delays, leading to significant fuel wastage and health issues. The study concludes with a strategic roadmap for "Small City Urbanism," recommending the decentralization of commercial hubs, the implementation of "Toto-bays," and the construction of peripheral ring roads to divert transit traffic away from the heritage core.

Key words: Passenger Car Unit, Smart City, Fuel wastage, Peripheral ring roads.

Introduction – The Crisis of the "Small City"

The narrative of Indian urbanization has shifted. For decades, the focus was on the "big four" metros, but the real explosion of growth is now occurring in smaller administrative capitals like Agartala. Agartala, the capital of Tripura, serves as a quintessential case study for "Small City" congestion. Unlike cities in the plains of central India, Agartala is geographically constrained. To its West lies the international border with Bangladesh, and to its South, the Haora River. This "border-locked" status means that the city cannot expand radially; it must grow in a linear, North-East direction, forcing all regional traffic through a few overburdened corridors.

The historical planning of Agartala was centered around the "Chowmuhani"—a traditional four-way intersection that served as both a transit node and a marketplace. In an era of rickshaws and pedestrians, this model was efficient. However, in 2024, the same Chowmuhanis must now accommodate private SUVs, heavy logistics trucks from the Akhaura Integrated Check Post, and thousands of e-rickshaws. The fundamental problem is that the "social life" of the road (vending, walking, socializing) is in direct conflict with its "economic life" (transit). This page sets the stage by arguing that Agartala's congestion is not just a result of "too many cars," but a result of a 19th-century street footprint trying to breathe in a 21st-century economy.

Literature Review and Structural Bottlenecks

Current scholarship on Agartala's infrastructure (Das & Boral, 2020) highlights a critical "infrastructure lag." While vehicle registration in Tripura has grown by nearly 12% annually, the effective road width in Agartala has remained static. A key reference in this field is Mitra et al. (2018), who classified Agartala's roads into "radial-concentric" patterns, noting that 88% of the city's roads are "minor." This means that the primary arterials, such as the Hari Ganga Basak (HGB) Road, must carry a load they were never engineered for.

The "bottleneck" in Agartala is often physical. Bridges like the Battala Bridge act as "funnels" where a 4-lane flow is suddenly compressed into 2 lanes. Previous studies by NIT Agartala

(Jaiswal & Pal, 2016) used VISSIM simulation to show that the "Saturation Flow" at major intersections is frequently reached within 15 minutes of the morning peak. This research builds upon that by analyzing "roadside friction"—the impact of illegal parking and encroachment on flow speed. In small cities, the absence of multi-level parking forces car owners to use the "carriageway" as a garage. This reduces a 7-meter road to a 4-meter lane, effectively cutting the road's capacity in half before a single vehicle has even moved.

Data Analysis – The Paratransit Revolution

The most significant change in Agartala's traffic dynamic over the last decade has been the "Toto" (E-rickshaw) revolution. While Totos have provided a green alternative to fuel-based engines, their impact on "traffic dynamic" is overwhelmingly disruptive.

Table 1: Vehicle Composition at Major Junctions (Peak Hour)

Vehicle Category	Battala Junction (%)	Post Office Chowmuhani (%)	North Gate (%)
Two-Wheelers	48	52	45
E-Rickshaws (Totos)	32	35	28
Private Cars/SUVs	12	8	15
Others (Cycle/Truck/Bus)	8	5	12

The data shows that Totos account for roughly one-third of the total volume. However, their "operational behavior" is the primary cause of congestion. Totos have a low top speed (25 km/h) and a high frequency of "unpredictable stops." Because there are no designated "bus stops" or "rickshaw stands," Totos stop in the middle of the road to pick up passengers. This creates a "shockwave" effect, where every vehicle behind the Toto must brake suddenly. On a narrow road like Sakuntala Road, a single Toto stopping can cause a tailback that extends 200 meters within 30 seconds. This page quantifies this "turbulence factor," arguing that the congestion in Agartala is a "slow-moving blockade" caused by unregulated paratransit.

The Impact of Smart City Interventions

Agartala was selected under the Smart City Mission to implement an Integrated Command and Control Centre (ICCC). The center-piece of this mission is the Adaptive Traffic Control System (ATCS).

Wait Time Reduction Post-ATCS (Minutes)

The data suggests a mixed result. At "standard" junctions like Fire Brigade Chowmuhani, wait times dropped by 55% because the AI could effectively time the green lights based on vehicle density. However, at "irregular" junctions like Battala, the improvement was only 15%. This is because the congestion at Battala is not a "timing" problem; it is a "capacity" problem. No amount of AI can move more cars if the bridge at the end of the junction is only 6 meters wide. This page discusses the "Limits of Technology," arguing that digital solutions in small cities like Agartala must be paired with "Geometric Corrections"—widening the physical turning radii of the roads so that the AI signals can actually clear the queues they detect.

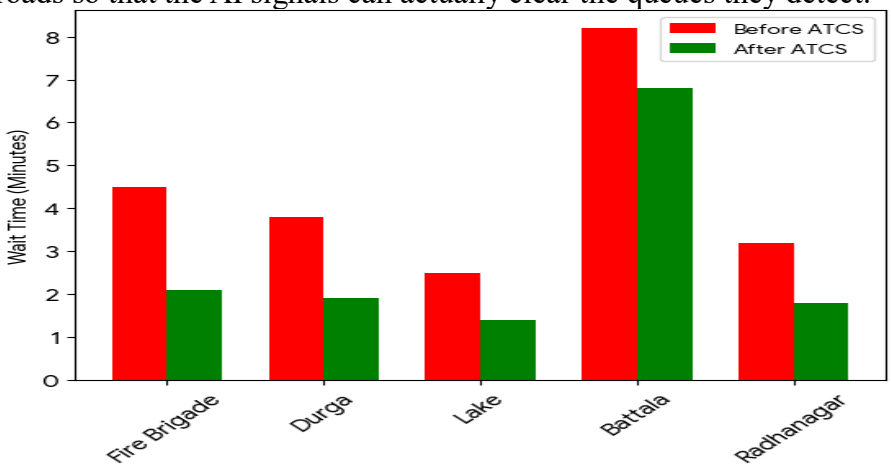

Fig: 1 Wait Time Reduction Post-ATCS (Minutes)

Environmental and Socio-Economic Consequences

The "Traffic Dynamic" in Agartala has direct health and economic impacts. Because the streets are narrow and flanked by high buildings, they act as "Urban Canyons," trapping pollutants at the nose-level of pedestrians and Toto passengers.

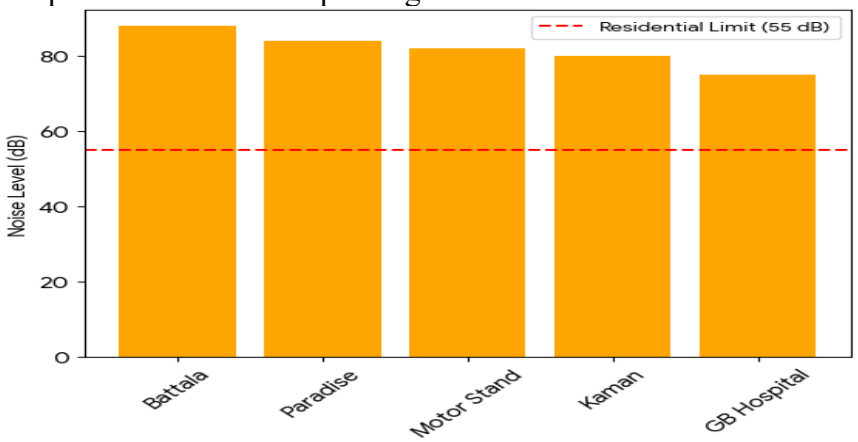

Fig: 2 Environmental Impact at Congestion Hotspots

The noise level at Battala (88 dB) is significantly higher than the residential limit of 55 dB. This constant exposure leads to "commuter stress" and hypertension among traffic police and local vendors. Economically, the cost is staggering for a small city. With over 20,000 private vehicles idling at signals for an average of 30 minutes a day, the cumulative fuel wastage is estimated at ₹15-18 crores annually. For a state like Tripura, this is a massive drain on the local economy. Furthermore, "Emergency Vehicle Delay" is a critical issue. Ambulances moving toward GB Hospital often get caught in the North Gate gridlock, where the "deadlock" is so tight that vehicles cannot even move aside to create a green corridor.

Case Study – The "Battala-Nagerjala" Choke Point

The Battala-Nagerjala stretch is the most congested 1.5 km in Tripura. It serves as the primary entry point for all traffic coming from the South (Udaipur/Sabroom) and the National Highway. The dynamic here is unique because it involves "Inter-Modal Conflict." Nagerjala is a major bus terminal, but the buses must exit onto a road that is already saturated with local Totos and market-goers.

The study found that "Market Encroachment" accounts for a 35% reduction in road capacity at Battala. The local fish and vegetable market spills onto the bitumen, forcing pedestrians to walk in the middle of the road. When a bus attempts to turn into the Nagerjala stand, it must navigate through this crowd, causing a total standstill for 5-7 minutes. This page argues that the "congestion" here is a symptom of poor "Land-Use Management." By allowing a major bus terminal and a major market to exist at the same node as a major highway entry, the city has designed a "perfect storm" of traffic chaos.

Conclusion and Policy Recommendations

Agartala's traffic crisis is a warning for all small Indian cities. It proves that technology alone (Smart Cities) cannot solve problems rooted in physical space and unregulated growth. The "dynamic" is currently a losing battle between increasing vehicle volume and shrinking effective road width.

Key Recommendations:

1. **Creation of "Toto-Bays":** Instead of allowing Totos to stop anywhere, the city must create designated bays every 300 meters, physically separated from the main lane.
2. **Decentralization:** Government offices and major markets must be moved out of the "Heritage Core" to peripheral areas like the New Capital Complex.
3. **The Ring Road Solution:** A bypass road is essential to ensure that transit trucks moving toward the Bangladesh border never enter the city's interior.
4. **Multi-Level Parking (MLP):** The city must utilize its vertical space. Building MLPs at Motor Stand and Shakuntala Road could reclaim 20% of the road width currently lost to

parked cars.

In conclusion, Agartala must shift from "Traffic Management" to "Mobility Management." The goal should not be to move more cars, but to move more people. By integrating paratransit into a structured system and reclaiming the road from static obstructions, Agartala can serve as a model for sustainable urbanism in the Northeast.

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