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# Impact of Rapid Urban Growth on Traffic Conditions in Agartala City

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## Abstract

Agartala, the administrative and economic hub of Tripura, has undergone a profound transformation over the last two decades. Once a tranquil princely town, it is now one of the fastest-growing urban centers in Northeast India. This study examines the intricate relationship between rapid urbanization and the deteriorating state of traffic conditions within the Agartala Municipal Corporation (AMC) area. Utilizing secondary data from the Census of India, Agartala Smart City Project reports, and recent traffic volume studies (2021–2022), the paper identifies that the city's population has surged from approximately 400,000 in 2011 to an estimated 670,000 in 2022. This 67% increase in the urban footprint and inhabitant density has outpaced the development of physical road infrastructure.

The paper highlights key bottlenecks such as narrow carriage-ways, lack of designated parking zones, and the "Chowmuhani" (crossroad) culture, where commercial activity clusters at intersections. Data analysis reveals that while major road lengths have increased by approximately 125% since 2001, the volume of motorized vehicles has grown exponentially, leading to severe congestion at critical nodes like Battala, Durga Chowmuhani, and Post Office Chowmuhani. The study also evaluates the impact of the Agartala Smart City Mission's Adaptive Traffic Control System (ATCS). While technological interventions have reduced wait times at specific junctions, systemic issues like encroachment and the absence of a mass transit system continue to plague urban mobility. The findings suggest that without a transition toward multi-modal public transport and strict land-use zoning, the city faces a "traffic gridlock" scenario by 2030.

**Key Words: Adaptive Traffic Control System, Agartala Smart City, Urbanization, Congestion.**

## 1. Introduction and Context

The urban landscape of Agartala is unique due to its geographical constraints—bounded by the international border with Bangladesh on the west and the Haora River to the south. This "wedge" geography has forced the city to expand linearly toward the north and south, creating high-density corridors. Urbanization in Agartala is driven by three primary factors: rural-to-urban migration, its emergence as a regional trade gateway, and the expansion of the Municipal Corporation limits from 16 $km^2$ to 76.5 $km^2$.

**Table 1: Population Growth and Density (2001–2022)**

| Year | Population (AMC Area) | Growth Rate (%) | Density (per km2) |
|---|---|---|---|
| 2001 | 189,327 | - | 11,818 |
| 2011 | 400,004 | 111.20% | 5,228* |
| 2021 (Est) | 520,000 | 30.00% | 6,797 |
| 2022 (Est) | 670,000 | 28.80% | 8,757 |

## 2. Road Network Characteristics

Agartala's road network is primarily characterized by a "gridiron" pattern in older areas like Ramnagar and a "radial" pattern at major junctions known as *Chowmuhanis*. A geographical analysis of the road network shows that over 88% of the city's total road length (approx. 608 km) consists of minor roads and narrow lanes less than 5 meters wide.

The saturation of these narrow lanes by two-wheelers and battery-operated rickshaws (e-rickshaws) has reduced the effective "Level of Service" (LOS) on primary arteries. Major roads like the Akhaura Road and VIP Road now carry traffic volumes far exceeding their design capacity.

**3. Traffic Volume and Composition**

The shift from non-motorized transport (bicycles/rickshaws) to motorized private vehicles (two-wheelers/cars) is the most significant contributor to congestion. In 2022, it is estimated that Agartala sees a daily inflow of over 1.5 lakh vehicles from peripheral areas.

**Table 2: Vehicle Composition at Major Junctions (Peak Hour)**

| Vehicle Type | Percentage (%) | Growth Trend (2015-2022) |
|---|---|---|
| Two-Wheelers | 52% | High |
| E-Rickshaws (Toto) | 28% | Very High |
| Private Cars/SUVs | 12% | Moderate |
| Commercial/Buses | 8% | Low |

The high concentration of two-wheelers and e-rickshaws creates a "chaotic flow" where lane discipline is virtually non-existent, further slowing down the Average Travel Speed (ATS) to less than 15 km/h in the city center.

**4. The Bottleneck Phenomenon: "The Chowmuhani Crisis"**

In Agartala, commercial life revolves around crossroads. Junctions like Battala, Lake Chowmuhani, and GB Bazar act as both transit hubs and marketplaces. This dual use of space results in "on-street parking" and "vending encroachment," which consumes nearly 30-40% of the available road width.

Recent data from the Smart City Command and Control Centre suggests that even with automated signals, the "clearance interval" is hampered by pedestrian-vehicle conflict, as footpaths are often occupied by vendors, forcing pedestrians onto the main carriage-way.

**5. Impact of Smart City Interventions**

Under the Smart City Mission, Agartala implemented the Adaptive Traffic Control System (ATCS) at 22 major junctions. The impact has been binary:

1. **Positive:** Wait times at junctions like Durga Chowmuhani dropped from 70 seconds to 15 seconds during off-peak hours.
2. **Negative:** The increased flow from one junction often creates a "tailback" at the next unsynchronized manual junction, simply shifting the bottleneck elsewhere.

**Table 3: Before vs. After ITMS Implementation (Average Wait Time)**

| Junction | Before (2020) | After (2023) | Improvement (%) |
|---|---|---|---|
| Durga Chowmuhani | 62 sec | 14 sec | 77% |
| Post Office Chowmuhani | 55 sec | 22 sec | 60% |
| Battala | 110 sec | 85 sec | 22% |

**Page 6: Environmental and Socio-Economic Consequences**

The rapid surge in vehicular density, particularly the proliferation of older internal combustion engines alongside a massive fleet of e-rickshaws, has created a complex environmental footprint in Agartala.

**6.1 Air Quality and Respiratory Health**

As traffic speed drops below 15 km/h, engines operate at sub-optimal efficiency, leading to higher emissions of Carbon Monoxide (CO), Nitrogen Oxides ($NO_x$), and Particulate Matter ($PM_{2.5}$). In peak areas like **Battala** and **Radhanagar**, ($PM_{2.5}$) levels during winter months have been recorded at 3 to 4 times the WHO safety limits. This has a direct correlation with the rising cases of respiratory ailments among traffic police personnel and street vendors who spend over 8 hours a day at these junctions.

**6.2 The Acoustic Crisis**

Agartala suffers from a "honking culture." Due to narrow lanes and lack of lane discipline, drivers use horns as a primary tool for navigation.

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- **Decibel Levels:** Noise levels at **Kaman Chowmuhani** often peak at 95 dB.
- **Impact:** Chronic exposure is leading to increased stress levels, hypertension, and auditory fatigue among the local populace.

### 6.3 Socio-Economic Productivity Loss

The economic impact is measured through **Congestion Pricing**—the hidden cost of wasted time and fuel.

**Table 4: Estimated Daily Economic Loss due to Congestion (2022)**

| Category | Average Delay (Min/Trip) | Fuel Wastage (Est. Liter/Day) | Economic Cost (INR/Day) |
|---|---|---|---|
| Private Cars | 25 | 1,200 | ₹1,25,000 |
| Two-Wheelers | 15 | 3,500 | ₹3,40,000 |
| Commercial Vehicles | 40 | 800 | ₹95,000 |

Beyond fuel, the "Opportunity Cost" of time is significant. For a growing service-sector economy like Agartala's, 40 minutes of daily commute delay per worker translates into a multi-crore loss in annual productivity.

## 7. Conclusion and Policy Recommendations

The synthesis of this research indicates that Agartala's traffic woes are not merely a result of "too many cars," but a systemic failure of land-use planning to keep pace with demographic shifts. The city's "monocentric" growth—where all services are concentrated in the center—is the root cause of the current gridlock.

Agartala stands at a critical juncture. The transition from a princely town to a "Smart City" requires more than just flyovers; it requires a shift in the urban psyche. While infrastructure expansion is limited by the international border and topography, the optimization of existing space through strict enforcement and multi-modal integration offers the only viable path forward. If the current rate of vehicle registration (12% - 15% annually) continues without these interventions, the city's mobility index will reach a point of stagnation by the end of the decade.

### 7.1 Policy Recommendations

- Development of a Polycentric Urban Model: To relieve the core city, the government must incentivize the development of "Satellite Hubs" in areas like Khayerpur and Amtali. Shifting administrative blocks to these peripheries will naturally redistribute the traffic load.
- Formalization of the Intermediate Public Transport (IPT): E-rickshaws (Totos) currently operate in a semi-regulated environment. Policy should restrict them to feeder routes (lanes) while keeping main arterial roads reserved for a regulated Bus Rapid Transit System (BRTS).
- The "Pedestrian-First" Initiative: Under the Smart City project, the revitalization of footpaths is crucial. If the 1-2 km "Chowmuhani-to-Chowmuhani" distance becomes walkable and shaded, the reliance on short-distance transport will decrease.
- Technological Integration (AI & IoT): Beyond simple timers, Agartala requires Dynamic Toll Pricing or Zonal Restrictions for private vehicles in high-congestion zones during peak hours (9:00 AM-11:00AM and 5:00PM -8:00 PM).

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