

A Perspective on Road Traffic Management in Prayagraj City

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Abstract

This study explores the pressing challenges of road and traffic management in Prayagraj, Uttar Pradesh, a rapidly expanding urban centre of cultural and economic significance. Despite its strong connectivity via four national highways, the city struggles with chronic traffic congestion, declining air quality, insufficient infrastructure, and an underperforming public transport network. Using a mixed-method approach—comprising a survey of 65 residents, field observations, and analysis of official data—the research identifies critical issues such as narrow roads, absence of pedestrian and cycling lanes, illegal parking, street encroachments, and inadequate traffic enforcement. Peak-hour analysis reveals severe congestion in commercial and institutional hubs like Civil Lines, Katra, and Chowk, where traffic volumes exceed road capacity. Air quality measurements indicate pollutant levels (PM_{10} , NO_2 , SO_2) consistently above permissible limits, posing significant public health concerns. Public perceptions point to dissatisfaction with enforcement practices, parking availability, and transport reliability, though there is broad support for sustainable reforms. Drawing on successful examples from Surat, Ahmedabad, and Pune, the study recommends integrated measures: strengthening multimodal public transport, implementing Intelligent Traffic Management Systems, expanding infrastructure for non-motorised transport, promoting electric vehicles, and applying congestion pricing. The findings highlight the need for a Comprehensive Urban Mobility Plan that combines participatory governance, sustainable urban design, and advanced technologies, aiming to shift from reactive traffic control to proactive, long-term mobility planning. While offering practical insights, the study recognises limitations in scope and data, suggesting future research should include longitudinal studies, behavioural analysis, and broader stakeholder engagement.

Keywords

Prayagraj, Traffic Congestion, Road Infrastructure, Public Transport, Intelligent Traffic Management Systems (ITMS), urban mobility, Air Pollution, Sustainable Transport, Congestion Pricing, Electric Vehicles, Participatory Governance.

Introduction

Urbanisation, a global phenomenon, has significantly transformed how people live, work, and travel. According to the United Nations (2019), India's urban population is projected to reach 600 million by 2031, a demographic shift that is intensifying pressure on public transport infrastructure. Prayagraj a prominent city in Uttar Pradesh, India is no exception. Known for its deep cultural and religious significance, the city is also undergoing rapid urban development. However, this accelerated growth is placing immense pressure on its infrastructure, especially in terms of road and traffic management.

Despite ongoing expansion of the road network, Prayagraj continues to grapple with numerous challenges, including the rising number of vehicles, a growing population, and unchecked urban sprawl. These factors have made road management a critical issue, affecting daily commuters, local businesses, and overall quality of life. Key concerns include traffic congestion, frequent jams, deteriorating road conditions, inadequate traffic signalling systems, and weak enforcement of traffic regulations. These problems are further magnified during major religious gatherings such as the Kumbh Mela, highlighting the city's lack of preparedness for large-scale events.

This paper explores the various challenges and potential opportunities related to road and traffic management in Prayagraj. It assesses the current state of infrastructure, evaluates the effectiveness of existing traffic control strategies, and identifies areas for improvement. Ultimately, it proposes actionable solutions aimed at ensuring safer, more efficient, and sustainable road transportation for both residents and visitors.

Objective of study

1. To identify and analyse the key challenges in road infrastructure and traffic management in Prayagraj, including congestion, pollution, inadequate facilities, and governance issues.
2. To assess public perceptions, environmental impacts, and infrastructural shortcomings through empirical survey data and secondary research, with a focus on

- peak-hour patterns, pollution levels, and enforcement gaps.
3. To propose sustainable, technological, and policy-driven solutions for improving urban mobility, including smart traffic systems, public transport enhancement, and integrated infrastructure planning.

Review of Literature

With increasing vehicle ownership, limited public transportation options, and fast urbanization, managing traffic on urban roads has become a crucial concern. As Pojani and Stead (2015) note, urban growth usually outpaces investment in sustainable transport systems, resulting in a significant reliance on private modes and ongoing congestion, making the problem more urgent in emerging nations. Public transportation only makes up 18–20% of urban journeys in India, according to the Ministry of Housing and Urban Affairs (MoHUA, 2017). This is significantly less than the global average of 40–60% for cities of similar size. Tiwari (2011) attributes this disparity, which disproportionately impacts low-income and transit-dependent people, to the physical dispersion of cities and inadequate investment in bus and rail networks. This tendency is best illustrated by medium-sized cities like Prayagraj, where urban limits have grown more quickly than organized public transportation, forcing commuters to rely on paratransit options like e-rickshaws and autorickshaws. High population density exacerbates air pollution, lengthens commutes, reduces urban livability, and amplifies transportation inefficiencies, according to Saha and Ghosh (2019).

Road infrastructure deficiencies exacerbate these issues. According to Gupta et al. (2020), poor traffic signal systems, a lack of pedestrian amenities, and degraded road surfaces are the main causes of bottlenecks in Indian cities. According to Kaur and Singh (2021), Prayagraj's transport system is severely overburdened, particularly during large events like the Kumbh Mela, where shoddy intersection design and insufficient signage lead to delays and accidents. Tiwari (2018) directly relates inadequate junction design to congestion, whereas Ponnaluri (2012) associates a lack of proper safety infrastructure with increased crash rates.

Current research emphasizes how Intelligent Traffic Management Systems (ITMS) can help with these kinds of problems. To enhance traffic flow, Kumar and Gupta (2018) recommend combining data analytics, real-time monitoring, and smart traffic lights. However, Pojani and Stead (2015) warn that ITMS works best when combined with environmentally friendly transportation methods, which improve efficiency. Such technology could be especially helpful in Prayagraj during peak traffic periods and significant events like the Kumbh Mela.

Traffic control is particularly difficult during large religious events. According to Verma and Jain (2017), managing millions of pilgrims within a constrained transportation network presents incredible logistical challenges. Without well-thought-out plans, these kinds of incidents can result in heavy traffic, increased risk of accidents, and overburdened municipal infrastructure. Temporary road closures and traffic jams frequently make Prayagraj's traffic situation worse.

The socioeconomic consequences of traffic mismanagement are enormous. According to Litman (2018), congestion reduces productivity, increases fuel consumption, and raises transportation expenses, disproportionately affecting low-income commuters. Ponnaluri (2012) associates poor traffic regulation with increased accident rates, which result in medical costs, financial losses, and psychological suffering. Saha and Ghosh (2019) emphasize the public health consequences of poor air quality, whereas Mishra and Prasad (2020) notice that time lost in traffic in Prayagraj raises business expenses, diminishes tourism attraction, and discourages investment.

Traffic congestion directly leads to environmental damage. Litman (2018) emphasizes that relying on private vehicles increases inefficiency and emissions, but Pucher et al. (2007) suggest that a lack of reliable public transportation infrastructure promotes automobile dependency. In Indian cities, automotive emissions contribute significantly to total nitrogen oxides and PM_{2.5} concentrations in peak traffic corridors (Guttikunda & Jawahar, 2014), providing serious health concerns to vulnerable groups (WHO, 2016).

The policy and regulatory environment significantly influences urban traffic conditions. Mehta (2018) highlights that lax enforcement of traffic laws in many cities results in widespread violations and unsafe driving behaviours. Prayagraj experiences comparable issues, where weak implementation of regulations compromises road safety. The research advocates for stronger penalties, improved enforcement systems, and increased public education to promote safer driving practices. Public perception fundamentally conditions the success of traffic-management interventions: attitudes, perceived behavioural control, and social norms predict willingness to comply with regulations and adopt alternative modes (Ajzen, 1991). Empirical transport literature shows that perceived safety, convenience, and service reliability frequently outweigh abstract environmental arguments when individuals choose travel modes (Steg & Gifford, 2005). In developing-city contexts, public acceptance is further constrained by poor last-mile connectivity and uneven service quality, which blunt the effectiveness of technical fixes unless addressed alongside community concerns (Pojani & Stead, 2015).

Methodology

The study employs a mixed-method approach, combining both quantitative and qualitative techniques:

Primary Data Collection: A structured survey of 65 residents of Prayagraj was conducted using Google Forms to gather public perceptions on traffic congestion, infrastructure, enforcement, and transport usage.

Secondary Data Analysis: Data from government sources (Prayagraj Transport Department, UP Pollution Control Board), research articles, and policy documents were analyzed to assess traffic volume trends, pollution levels, and infrastructural gaps.

Field Observation and Case Studies: Congested areas like Civil Lines, Katra, Chowk, and Prayagraj Junction were profiled for physical bottlenecks. Successful traffic models from cities like Surat and Ahmedabad were studied for comparative insights.

Analysis

Road Infrastructure and Public Transport

Four major national highways—NH19, NH30, NH35, and NH330—support Prayagraj's transportation system and connect it to important urban centers including Delhi, Kanpur, Varanasi, Lucknow, and Rewa (Ministry of Road Transport and Highways, 2023). Despite these vital connections, the city's road infrastructure struggles to accommodate the rising traffic volume. Many roads are narrow and lack dedicated pedestrian and cycling pathways, compelling non-motorised commuters to share space with motor vehicles, thereby increasing the risk of accidents. Furthermore, the absence of flyovers at key intersections, particularly in high-density zones like Civil Lines and Alopibagh, contributes to recurring traffic bottlenecks.

The public transport system is similarly beset with structural shortcomings, such as overcrowded buses, unreliable schedules, and limited route coverage (Saha & Ghosh, 2019). Peripheral areas face additional challenges due to poor last-mile connectivity, restricting accessibility for residents. As a result, dependence on private vehicles has grown, placing further strain on congested roadways. Strengthening and diversifying the public transport network could significantly reduce reliance on personal modes of travel and help mitigate the city's chronic traffic congestion (Pucher & Korattyswaroopam, 2004).

TABLE :- Infrastructure Gaps in Major Roads and Traffic Hotspots of Prayagraj

Road/Location	Pedestrian Lanes	Cycling Lanes	Average Road Width (m)	Flyover Availability	Observed Issues
Civil Lines	No	No	6	No	High commercial density; severe peak-hour congestion; encroachment by street vendors; no safe pedestrian or cycling infrastructure.
Alopibagh	Partial	No	7	No	Mixed traffic with e-rickshaw clustering; inadequate pedestrian space; illegal street parking; congestion spikes during Kumbh and Magh Mela.
Prayag Station	No	No	8	Yes	High volume of passenger and freight movement; congestion at station approaches; no cycling lanes; delays despite flyover.
Dhoomanganj	Partial	No	5	No	Narrow carriageway; roadside encroachment; unsafe pedestrian crossings; heavy congestion during market hours.
Johnstonganj	No	No	5	No	Extremely narrow roads; high-density market area; encroachments; severe gridlock during festivals and peak hours.
Chowk	No	No	4.5	No	Dense traditional market; minimal road width; slow traffic movement; high pedestrian-vehicle conflict.
Lukerganj	Partial	No	6	No	Residential-commercial mix; poor lane discipline; no pedestrian facilities; periodic flooding worsens congestion.
Nawab Yusuf Road	Partial	No	6.5	No	Important arterial route; illegal parking; pedestrian spill-over onto carriageway; congestion at intersections.

Traffic Congestion and Environmental impact:

Traffic congestion in Prayagraj has become a pressing urban challenge, driven by rapid urbanisation, exponential growth in vehicle ownership, and inadequate road infrastructure. According to data from the Prayagraj Transport Department (2024), the district's motor vehicle population increased 2.4 times between 2014 and 2024—from approximately 663,000 to 1.59 million. Within this period, the number of two-wheelers surged from about 540,403 to 1,331,546, mopeds from 32,232 to 53,211, and cars from 91,245 to 207,796. This sharp rise in automobile ownership has significantly intensified congestion, particularly during peak commuting hours and school holidays.

The city has identified 22 to 32 main hotspots for congestion, most of which are located in older parts of the city and at important crossroads such as Nawab Yusuf Street, Johnstonganj, Phaphamau Ganga Bridge, Chowk, Civil Lines, and Lahawalia. Roads that are too narrow, e-rickshaw crowding, illegal on-street parking, and high traffic volumes are some of the factors that cause bottlenecks. During busy times and religious events, there is severe traffic congestion, especially in Civil Lines and Alopibagh, which causes long delays and inefficiency. The main structural reasons of traffic congestion continue to be excessive vehicle density, narrow road widths, and inadequate traffic management techniques.

This congestion's effects on the environment are as concerning. The main cause of air pollution in Prayagraj is vehicle emissions; in high-traffic areas, concentrations of pollutants such as PM₁₀, NO₂, and SO₂ have been found to be higher than allowed (Uttar Pradesh Pollution Control Board [UPPCB], 2023). Long-term exposure to these contaminants is associated with increased cardiovascular risks, lung function decline, and respiratory disorders (Guttikunda & Mohan, 2014). The continued existence of poor

air quality in crowded areas emphasizes how urgently integrated environmental and transportation policies are needed to lower traffic, encourage greener modes of transportation, and enhance urban air quality.

TABLE :- Air Quality Data from Major Roads and Traffic Hotspots of Prayagraj

Location	PM ₁₀ (µg/m ³)	NO ₂ (µg/m ³)	SO ₂ (µg/m ³)	Key Observations
Civil Lines	210	52	23	Commercial hub with constant vehicle flow; pedestrian-vehicle conflict increases exposure.
Alopibagh	245	67	30	High traffic during religious events; heavy e-rickshaw and auto-rickshaw activity.
Prayag Station	275	80	35	Major passenger and goods movement; diesel emissions from buses and freight vehicles.
Dhoomanganj	220	50	25	Market congestion and poor ventilation due to narrow lanes.
Johnstonganj	260	75	34	Extremely narrow market roads; vehicular idling causes elevated NO ₂ .
Chowk	255	72	31	Dense marketplace with high pedestrian flow; traffic fumes trapped in built-up area.
Lukerganj	215	54	26	Mixed residential-commercial emissions; seasonal dust spikes.
Nawab Yusuf Road	225	58	27	Arterial road with frequent illegal parking and signal delays.

Source: Uttar Pradesh Pollution Control Board [UPPCB], 2023

Traffic Flow Metrics, Peak-Hour Analysis, and Pollutant Trends

The interdependence of air pollution and traffic congestion in urban areas such as Prayagraj poses a serious obstacle to effective city administration. Carbon monoxide, nitrogen oxides, particulate matter, and hydrocarbon emissions are increased by congestion because it prolongs vehicle idling and stop-and-go traffic (Colville et al., 2001). Prayagraj's urban mobility is under increasing pressure because of the city's growing car population, poor infrastructure, and ineffective traffic control systems. A data-driven urban transport policy must take into account peak-hour habits, traffic flow patterns, and related pollution trends.

Prayagraj's major roads, collector streets, and crowded metropolitan areas all have quite different traffic patterns. The typical daily traffic volume in core areas including Civil Lines, Chowk, Alopibagh, and the area around Prayagraj Junction is between 40,000 and 60,000 cars, according to research and real-time monitoring conducted by the Prayagraj Smart City Command Centre (2022–2023).

Area	Peak Congestion Hour	Vehicle Flow (approx. per hour)	Main Causes
Civil Lines	9–11 AM & 5–8 PM	2500–3500	Mixed traffic, signal delays
Alopibagh	8–10 AM & 6–8 PM	2000–3000	Narrow roads, street vendors
Chowk	10 AM–1 PM	2700–3500	Encroachments, pedestrian overflow
Katra	11 AM–2 PM & 6–9 PM	2800–3600	Commercial zone, University, illegal parking
Near Railway Station	All day (peak at 5–7 PM)	4500+	Auto rickshaw crowding, drop-offs

Sources: Prayagraj Smart City Command Centre

Peak-hour congestion in Prayagraj corresponds to school timings, office hours, and market openings. The **two primary congestion windows** are: **Morning Peak**: 8:30 AM – 11:00 AM and **Evening Peak**: 5:00 PM – 8:00 PM. These hours account for more than **40% of the total daily vehicle flow**, creating pressure on critical intersections like the High Court Crossing, Subhash Crossing, and intersections near MG Marg and Kachahari Road. Based on the survey conducted during the study, daily time lost due to congestion, 62.1% report losing more than one hour, 18.2% report 30–60 minutes, and 12.1% report a delay of less than 10 minutes.

Pollutant	Average Annual Level	Permissible Limit (24-hr avg, CPCB)
PM10	140–160 $\mu\text{g}/\text{m}^3$	100 $\mu\text{g}/\text{m}^3$
PM2.5	85–95 $\mu\text{g}/\text{m}^3$	60 $\mu\text{g}/\text{m}^3$
NO ₂	45–55 $\mu\text{g}/\text{m}^3$	40 $\mu\text{g}/\text{m}^3$
CO	2.5–3.0 mg/m^3	2.0 mg/m^3
SO ₂	25–30 $\mu\text{g}/\text{m}^3$	20 $\mu\text{g}/\text{m}^3$

Source: UPPCB Monitoring Station Reports 2022–2023

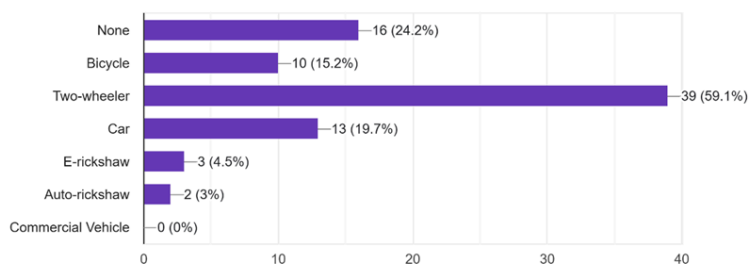
Pollutant concentrations consistently spike during peak traffic hours. Notable observations include: **PM10 levels** increase by **35–45%** between 8–11 AM and 5–8 PM. **NO₂ concentrations** are **30–35% higher** during evening hours due to vehicle idling and slow movement. **CO levels** rise sharply at junctions with frequent signal halts.

Survey Analysis of Road Transport Traffic Management

An empirical survey has been conducted among 65 respondents in Prayagraj city using Google form which provides critical insights into the existing traffic conditions, perceptions of public infrastructure, and citizen experiences with congestion and enforcement. The survey reflects a range of views and data points that not only map current problems but also suggest a collective desire for comprehensive reform.

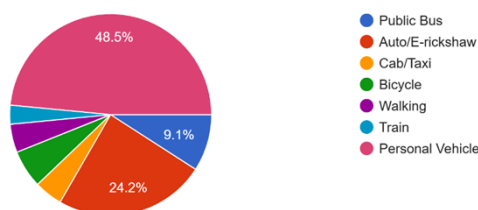
Type of Vehicle Owned

66 responses



Usual Mode of Transportation

66 responses

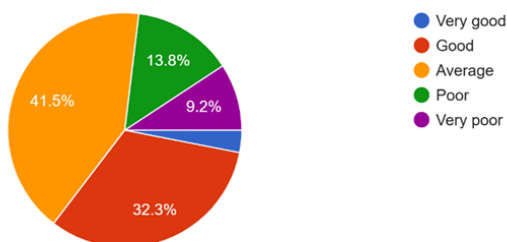


Perceptions of Traffic Conditions

The public perception of traffic conditions in Prayagraj is notably varied. According to the data, 41.5% of respondents rate the traffic situation as “average,” 32.3% describe it as “good,” 13.8% consider it “poor,” while only 9.2% term it “very good.” This diversity of opinion appears closely linked to the modes of transport used. A significant proportion (48.5%) rely on personal vehicles, followed by 24.2% who depend on auto-rickshaws and 9.1% who use public buses.

How would you rate the overall traffic situation in Prayagraj?

65 responses



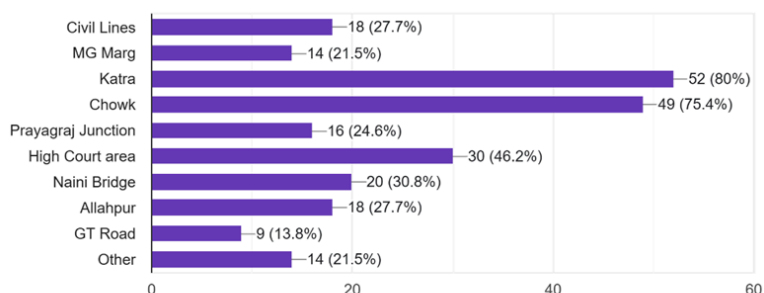
These patterns correspond to the “modality trap” discussed by Pucher et al. (2007), where individuals’ reliance on private vehicles not only shapes their perception of traffic congestion but also exacerbates it. The absence of reliable and comfortable public transport systems forces greater dependence on personalised means, adding to road density and reducing satisfaction.

Congestion Hotspots in the City

The city reportedly contains between 22 to 32 significantly congested zones. Among these, Katra (identified by 80% of respondents) and Chowk (75.4%) emerge as the two most congested localities. Other problematic areas include the High Court region (46.2%), Civil Lines (27.7%), and Prayagraj Junction (24.6%).

Which areas are most congested?

65 responses



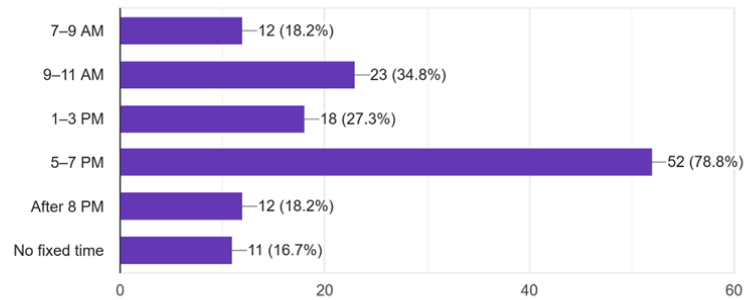
The clustering of congestion in central commercial or institutional areas aligns with the findings of Rodrigue, Comtois, and Slack (2017), who argue that spatial accessibility to economic and administrative hubs results in congestion pressure points unless offset by proper zoning and infrastructure.

Peak Hours and Time Lost in Congestion

The analysis identifies the evening hours (5:00–7:00 PM) as the most critical period for traffic congestion, acknowledged by 78.8% of respondents. Morning hours (9:00–11:00 AM) were also flagged by 30.8% of respondents. With regard to daily time lost due to congestion, 62.1% report losing more than one hour, 18.2% report 30–60 minutes, and 12.1% report a delay of less than 10 minutes.

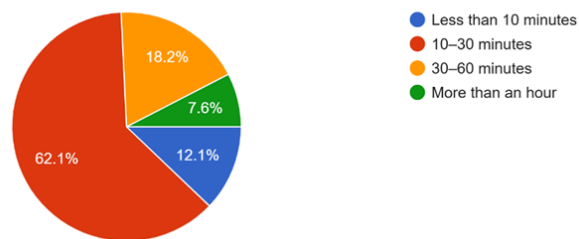
Peak traffic congestion hours (Select all that apply)

66 responses



On average, how much time do you lose daily due to traffic congestion?

66 responses



These figures reinforce Anthony Downs' (2004) concept of the "triple convergence," where route, time, and mode choices by commuters congest the same infrastructure at peak hours, reducing overall efficiency.

Perceived Causes of Traffic Congestion

The causes of traffic congestion are multi-faceted. The major issues cited by respondents include:

Illegal parking (80.3%)

Ineffective traffic management (63.6%)

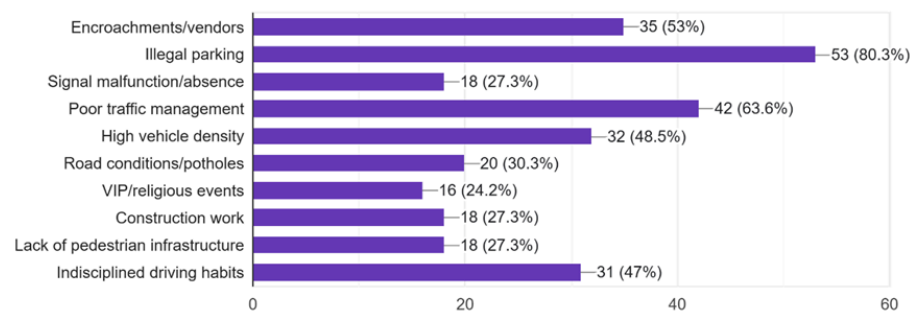
Encroachments and street vendors (53%)

High vehicle density (48.5%)

Undisciplined driving habits (47%)

Major causes of traffic congestion (Select up to 4)

66 responses



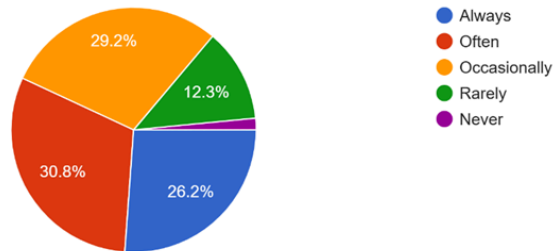
Other reported causes include poor road conditions, malfunctioning traffic signals, ongoing construction, and VIP/religious processions. These findings mirror those discussed in Mitra's (2005) analysis of Indian urban mobility, where a lack of systemic discipline, unregulated informal activities, and low institutional accountability converge to impair traffic flow.

Enforcement and Governance

Traffic enforcement, as perceived by citizens, appears sporadic and insufficient. While 30.8% of respondents claim they “often” see traffic police managing flow, 29.2% see them “occasionally,” and 26.2% “never” witness any enforcement on site. When asked about the adequacy of traffic signage and signals, 50.8% reported them as “functional and sufficient,” 38.5% said such facilities existed “only in certain areas,” and 10.8% believed they were “largely absent.”

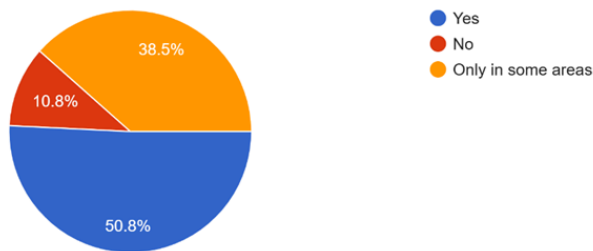
How frequently do you see traffic police managing traffic?

65 responses



Are traffic signals and signage adequate and functional?

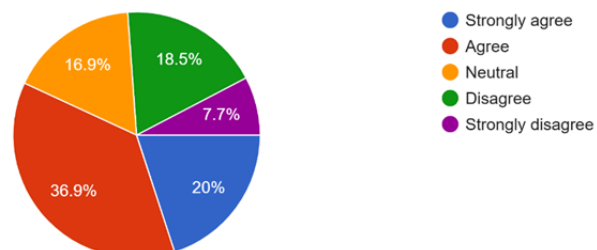
65 responses



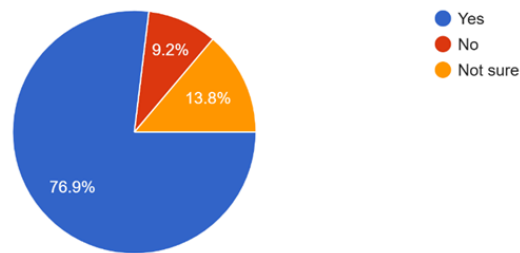
Perceptions of rule enforcement were similarly mixed. About 36.9% agreed that rules were enforced effectively, 20% strongly agreed, while 18.5% disagreed and 7.7% strongly disagreed. Concerning the integrity of enforcement practices, 76.9% believed that corruption or bias significantly compromised traffic rule enforcement.

Do you think traffic rules are effectively enforced?

65 responses



Do you think corruption or bias affects traffic enforcement?
65 responses

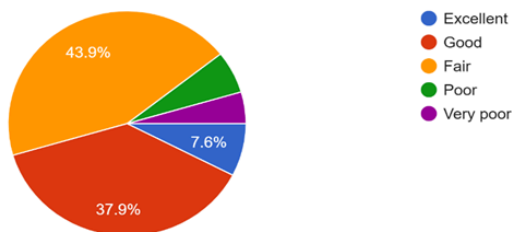


These insights are consistent with Mohan's (2008) research on traffic governance in Indian cities, which identifies irregular enforcement, perceived impunity, and administrative corruption as core impediments to effective traffic management.

Road Infrastructure and Quality

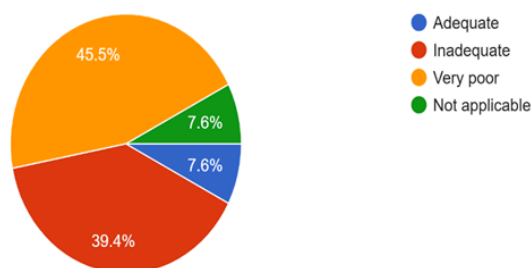
Infrastructure and road quality also emerged as important determinants of public satisfaction. Regarding road conditions used regularly, 43.9% rated them as "good," while 7.6% marked them as "excellent."

Rate the condition of the roads you regularly use:
66 responses



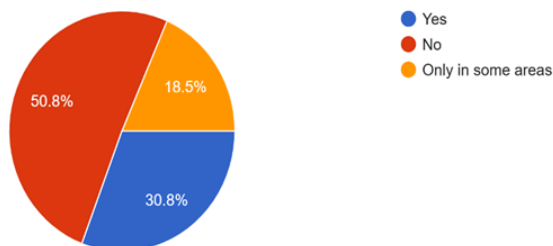
Parking availability in high-traffic zones was rated as "very poor" by 45.5% and "inadequate" by 39.4%, while only 7.6% found it "adequate."

Parking availability in high-traffic zones:
66 responses



Are there enough pedestrian crossings and footpaths?

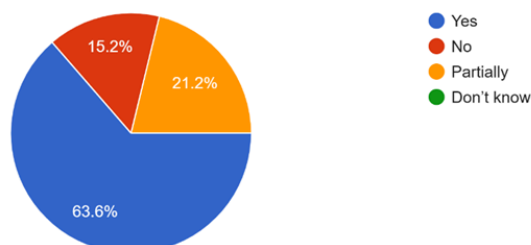
65 responses



Flyovers and bypasses were assessed for their effectiveness in reducing congestion: 63.6% found them "helpful," 21.2% said they were "partially effective," and 15.2% felt they had "no impact."

Are existing flyovers/bypasses effective in reducing congestion?

66 responses



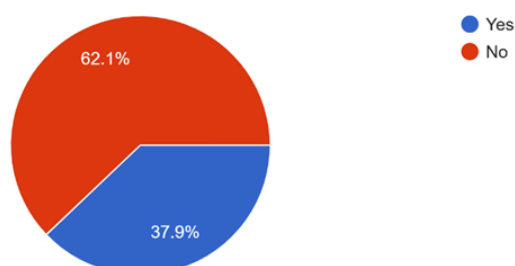
These findings substantiate the argument by Agarwal and Zimmerman (2008) that without integrated infrastructure planning—especially for parking, road expansion, and pedestrian facilities—flyovers alone cannot address systemic congestion.

Public Transport and Alternatives

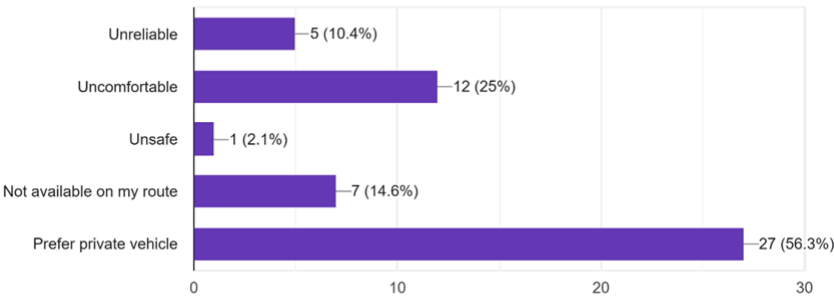
Public transport in Prayagraj appears under-utilised. While only 37.9% reported using it, 62.1% did not. Reasons included a preference for private vehicles (56.3%), perceived discomfort (25%), non-availability on required routes (14%), unreliability (10.4%), and safety concerns (2.1%).

Do you regularly use public transport?

66 responses

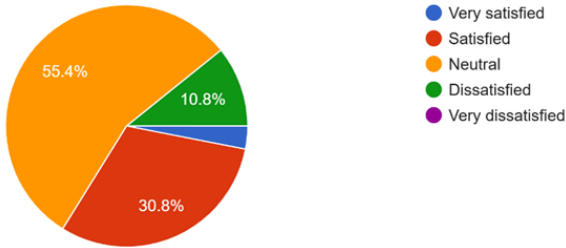


If No, why not?
48 responses

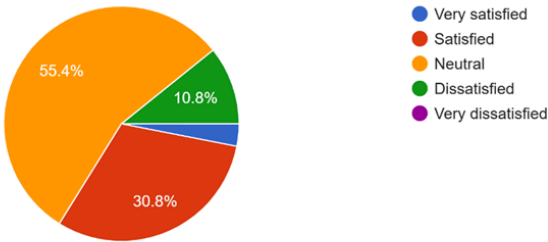


Satisfaction levels with existing public transport were generally lukewarm: 55.4% were neutral, 30.8% satisfied, and 10.8% dissatisfied. However, when asked about potential use of metro, BRTS, or other mass transit systems, 60% said they would “definitely” use them if available, 21.5% responded “maybe,” and 18.5% said “no.”

How satisfied are you with public transport?
65 responses



How satisfied are you with public transport?
65 responses

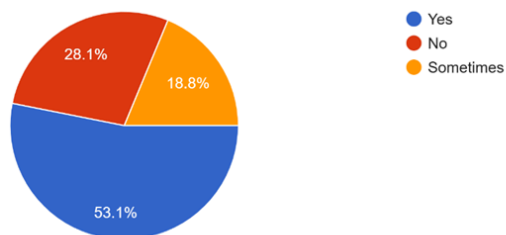


These results echo the work of Cervero and Dai (2014), who contend that successful public transport adoption in urban areas depends on reliability, comfort, coverage, and cost-efficiency—areas where Prayagraj appears to be lagging.

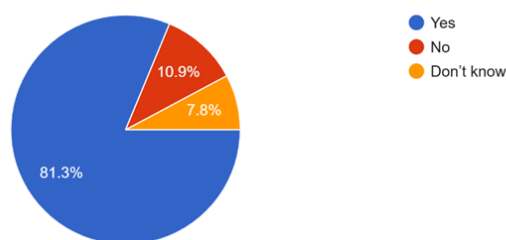
Public Opinion on Safety and Long-Term Improvements

Safety perceptions as pedestrians varied: 53.1% felt safe, 28.1% felt unsafe, and 18.8% felt safe only “sometimes.” A particularly concerning statistic emerged with regard to vulnerable groups—81.3% of respondents believed that children, the elderly, and the disabled face significant challenges navigating city roads.

Do you feel safe as a pedestrian in Prayagraj?
64 responses

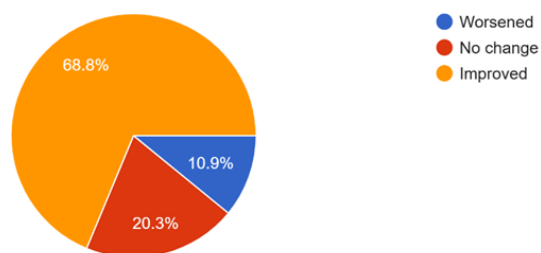


Do elderly/disabled/children face challenges on the roads?
64 responses



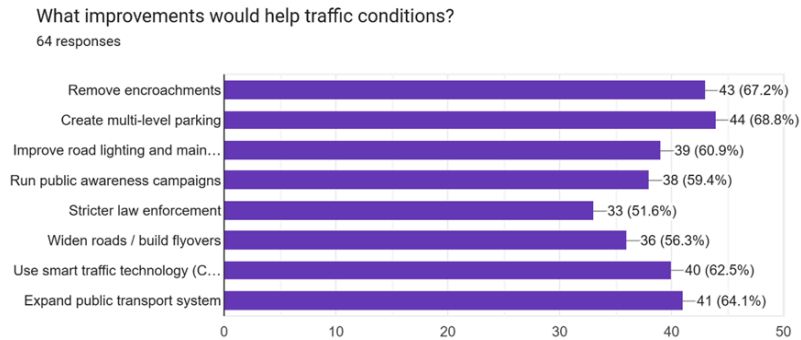
When asked whether traffic conditions had changed in the last five years, 68.8% believed they had "improved," 20.3% felt there was "no change," and 10.9% thought the situation had "worsened."

How have traffic conditions changed in the last 5 years?
64 responses



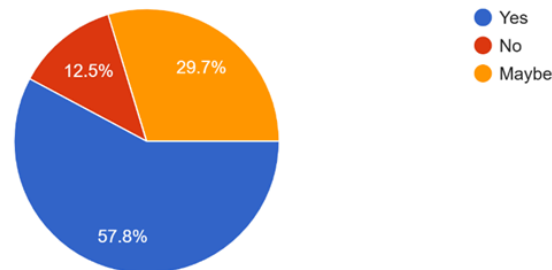
As for improvement suggestions, respondents advocated for:

- Multi-level parking structures (68.8%)
- Removal of encroachments (66.2%)
- Use of smart traffic technology (62.5%)
- Expansion of public transport (64.1%)
- Better street lighting (60.9%)



Additional suggestions included running awareness campaigns, widening roads, constructing flyovers, and enforcing stricter traffic laws. Notably, 57.8% of participants expressed a willingness to participate in public consultations related to traffic planning, indicating a constructive civic engagement that urban planners should harness.

Would you participate in public consultations on traffic planning if invited?
64 responses



Assessment of Policies and Infrastructure

The evidence gathered from Prayagraj highlights not only widespread dissatisfaction with current traffic conditions but also a notable degree of civic awareness and readiness to contribute to solutions. Persistent challenges such as illegal parking, weak governance, inadequate public transport, and physical bottlenecks collectively exacerbate the city's mobility crisis. Achieving sustainable improvements will require a coordinated strategy combining stricter law enforcement, transparent administration, investment in pedestrian facilities, and expansion of multimodal transport options. Importantly, residents should be viewed not merely as policy recipients but as active participants in shaping inclusive and efficient urban transport systems.

Evaluation of Existing Traffic Governance Framework

Traffic regulation in Prayagraj is shaped by a combination of institutional shortcomings, infrastructure limitations, and rapid urban expansion, all of which strain the city's transport network. Although national guidelines such as the National Urban Transport Policy (2006) promote sustainable mobility, inclusive planning, and enhanced public transport, local-level implementation has been uneven and fragmented (Ministry of Urban Development, 2006). Manual policing and static control methods remain dominant, with only 30.8% of respondents reporting regular police presence and 76.9% expressing concerns about corruption in enforcement. Despite the city's Smart City status, advanced measures like Intelligent Traffic Management Systems (ITMS), CCTV-based monitoring, and digital penalty systems are minimal or absent. Survey findings reveal openness to reform: 60% of participants expressed willingness to use mass transit options like Metro or BRTS, while a majority supported solutions such as multilevel parking (68.8%), expanded public transport (64.1%), and adoption of smart traffic technologies (62.5%). This underlines the potential for a Comprehensive Urban Mobility Plan (CUMP) tailored to the city's context, integrating infrastructure upgrades, pedestrian safety, transparent governance, and sustainable transit solutions (Litman, 2018; Agarwal & Zimmerman, 2008).

Identification of Physical and Systemic Gaps

Prayagraj's traffic network is hindered by multiple structural and operational weaknesses that disrupt both vehicular and pedestrian movement. Surveys pinpoint major congestion

hotspots—Katra, Chowk, the High Court area, Civil Lines, and Prayagraj Junction—where high traffic density stems from commercial, institutional, and transit significance. Narrow roads, lack of dedicated parking, and encroachments by informal vendors and illegally parked vehicles are common features. Illegal parking (cited by 80.3% of respondents) and street vending (53%) emerge as leading causes of congestion, echoing the findings of Mitra (2005) and Mohan (2008) on unregulated urban spaces. Inadequate multilevel parking, poor signal coordination, and absence of pedestrian facilities intensify these problems. Additional issues—potholes, degraded road surfaces, and uncoordinated utility repairs—further restrict capacity, reflecting weak preventive maintenance and integrated planning.

Equally pressing are the “missing links” in urban mobility governance. While national policies like the National Urban Transport Policy and the Smart Cities Mission promote technology-driven and multimodal transport, local implementation is incomplete. Flyovers and bypasses exist but are perceived as only partially effective (21.2%) or ineffective (15.2%) without wider network integration. Public transport suffers from poor comfort, limited route access, and low reliability, leading to underuse. The neglect of non-motorised transport infrastructure, especially for vulnerable groups such as the elderly and disabled (identified by 81.3% of respondents), reveals a significant planning gap. Addressing these deficiencies will require a data-driven, integrated, and community-engaged approach aligned with the evolving needs of Prayagraj’s urban landscape.

Prospective Solutions

Strategies for Sustainable Traffic Management

In Prayagraj, lowering pollution levels and relieving traffic require a larger share of sustainable transportation options. This can be accomplished by improving public transportation’s dependability, frequency, and route coverage, especially in underprivileged areas. Promoting carpooling programs can help reduce the number of private automobiles on the road. Mobility patterns that are healthier and more environmentally friendly will be encouraged by increasing the number of non-motorized transportation options, such as walking and cycling, through dedicated lanes and pedestrian-friendly infrastructure. Public awareness campaigns emphasizing the advantages of sustainable transportation for the environment and human health should back these activities and encourage a shift in lifestyle toward more environmentally friendly travel habits.

Integration of Traffic Management Technologies

There is a lot of potential to increase mobility efficiency through the use of intelligent traffic management technology. Adaptive smart signals can optimize traffic flow and cut down on wait times by instantly adjusting to traffic circumstances. Traffic patterns can be analyzed by AI-enabled monitoring systems, which helps with evidence-based planning to avoid bottlenecks. Digital signage or smartphone apps that provide real-time travel updates might direct commuters toward less crowded routes, relieving traffic on important thoroughfares. These devices assist reduce the environmental effects of stop-start and idle driving while also streamlining urban transport.

Learning from Successful Urban Models in India

The traffic reform in Prayagraj is exemplified by a number of Indian cities. To enhance discipline and lessen traffic, Surat’s Smart Cities Mission has successfully implemented an Intelligent Traffic Management System that combines digital enforcement, CCTV monitoring, adaptive signals, and automatic number plate recognition. With dedicated corridors, GPS tracking, and automated fare collection, Ahmedabad’s Janmarg Bus Rapid Transit System (BRTS) has increased public transportation utilization and decreased reliance on private vehicles (Cervero & Dai, 2014). Pune has improved safety and inclusivity by incorporating non-motorized transportation infrastructure, such as bike lanes and spacious sidewalks, into its Urban Street Design Guidelines (Tiwari, 2011).

Prayagraj’s lack of multilevel parking and reliance on manual police, on the other hand, highlight the need for modernization. The examples of Indore and Bhubaneswar show how stringent enforcement, community participation, and digital government can coexist. The removal of encroachment, GPS-enabled buses, and responsive planning have helped Indore, while the Integrated Command and Control Centre (ICCC) in Bhubaneswar manages traffic, emergency services, and surveillance to ensure quicker and more effective responses (World Bank, 2013). A Comprehensive Mobility Plan could assist Prayagraj in transitioning to sustainable, technologically advanced, and community-supported traffic management by implementing comparable, situation-specific strategies.

Strategic Recommendations for Urban Mobility Enhancement

Policy Reforms for Efficient Road Use and Lower Emissions

In Prayagraj, addressing the twin issues of traffic jams and environmental degradation necessitates extensive, forward-looking policy changes. Promoting the use of public transportation should be prioritized through targeted subsidies, lower tickets, and enhancements to passenger comfort, coverage, and dependability. By implementing policies like pedestrian-only zones, staggered commutes, and congestion fees, regulatory activities must try to limit the use of private vehicles in crowded metropolitan areas. In

addition to promoting electric cars (EVs) through financial incentives, the construction of charging infrastructure, and awareness campaigns, stringent enforcement of pollution standards is essential. When combined, these measures can greatly lower pollution levels while promoting a just and sustainable transportation system.

Infrastructure Expansion and Inclusive Mobility Corridors

To reduce traffic and guarantee safety, transportation infrastructure must be strengthened. By building flyovers and bypasses in key locations, through-traffic will be redirected away from congested intersections, relieving strain on central routes. In order to promote environmentally friendly travel and improve safety, it is equally crucial to have designated lanes for non-motorized transportation, such as bike lanes and pedestrian walkways (Tiwari, 2011; Saha & Ghosh, 2019). Road networks in high-traffic or poorly linked areas should be upgraded to increase overall connectivity, shorten travel times, and facilitate easier traffic flow (Ponnaluri, 2012). Such infrastructure improvements can be the cornerstone of a robust, future-ready urban transportation system if they are carried out in a systematic and coordinated manner.

Advancing Electric Mobility and Managing Traffic Demand

Cleaner transportation can be accelerated by encouraging EV adoption through tax breaks, purchase subsidies, and reduced registration costs, as well as by quickly expanding the number of charging stations. An efficient demand-management tactic that discourages the use of private vehicles and promotes the use of public transportation, bicycles, or shared mobility is the introduction of congestion pricing in regions that experience high traffic during peak hours. In order to further the larger goals of sustainable, ecologically conscious urban development, the money collected from congestion fees can be used to upgrade pedestrian infrastructure, improve public transportation, and implement smart mobility technologies (Litman, 2018; Pucher et al., 2007).

Conclusion

The present study draws attention to Prayagraj's severe and ongoing traffic management issues, which are mainly defined by heavy traffic, increasing pollution, poor road infrastructure, and a public transportation system that is underdeveloped and unable to keep up with the demands of an expanding urban population. Well-known areas like Civil Lines and Alopibagh frequently see extreme traffic jams during rush hour, which raises levels of air pollutants such as particulate matter (PM₁₀), nitrogen dioxide (NO₂), and sulfur dioxide (SO₂). Inefficient traffic flow is caused by a number of flaws in the city's current road system, including narrow lanes, a lack of bike lanes and pedestrian pathways, and a lack of grade-separated flyovers. Furthermore, the limited capacity and unreliability of public transport compel citizens to rely heavily on private vehicles, thereby exacerbating congestion and emissions.

In order to address these issues, the study suggests a multifaceted strategy centered on sustainable urban mobility. This entails encouraging carpooling, encouraging the use of public transit, and supporting non-motorized means like walking and cycling. Adaptive traffic lights, AI-powered traffic monitoring, and real-time traffic analytics are examples of technological interventions that can be integrated to promote more efficient traffic regulation. Investments in infrastructure are still necessary, though. Building additional flyovers, creating bike and bus lanes, and creating bypass corridors are all necessary to guarantee efficient traffic flow over important city thoroughfares. Policy changes like enacting congestion pricing schemes and providing incentives for the use of electric vehicles might also have a major impact on reducing urban air pollution and traffic congestion.

Although this study provides insightful information about Prayagraj's traffic management problems, it must be acknowledged that it has a number of limitations. The very small sample size of 65 respondents from whom the primary data was gathered may not fully represent the range of viewpoints found in the city's many neighborhoods and socioeconomic categories. The lack of seasonal or long-term data is another significant drawback. Due to its narrow temporal span, this study is unable to fully represent Prayagraj's traffic situation during important religious events, school holidays, and monsoons. Furthermore, the accuracy of environmental evaluations may be impacted by the dependence on secondary sources for data on traffic flow and pollutants in the absence of real-time monitoring methods. Geographically, the focus is concentrated on central and high-traffic areas such as Civil Lines, Chowk, and Katra. As a result, the study may overlook growing traffic challenges in peripheral and rapidly urbanising regions of the city. The research also lacks institutional perspectives—interviews or consultations with traffic officials, urban planners, or policymakers were not included. This omission limits a deeper understanding of administrative challenges and implementation gaps in traffic governance. Although case studies from cities like Ahmedabad and Surat are discussed, the study does not assess their contextual applicability to Prayagraj's specific urban environment. Lastly, while the study touches on issues such as illegal parking, street encroachments, and public non-compliance, it does not delve into the behavioural and cultural dynamics that often shape traffic patterns in Indian cities. Future research should aim for a more comprehensive approach—incorporating longitudinal data, stakeholder interviews, behavioural studies, and real-time monitoring—to better inform sustainable urban mobility strategies in Prayagraj.

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