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# Impact of vehicular pollution on overall quality of urban life

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**Abstract -** *Rapid urbanisation and motorisation have significantly increased vehicular pollution in cities, making road transport one of the dominant contributors to urban air pollution. Pollutants such as particulate matter ($PM_{2.5}$, $PM_{10}$), nitrogen dioxide ($NO_2$), and carbon monoxide (CO) have severe implications not only for environmental quality but also for public health and overall urban livability. Vehicular pollution affects multiple dimensions of urban life, including physical health, commuting experience, walkability, comfort, productivity, and social equity.*

*This study examines the impact of vehicular pollution on the overall quality of urban life from a planning and policy perspective. The research is based on a qualitative analysis of secondary data obtained from government reports, published literature, and policy documents. Case studies of Delhi and Bengaluru are analysed to understand pollution intensity, vehicular characteristics, health impacts, livability outcomes, and policy responses.*

*The findings indicate that vehicular pollution significantly deteriorates air quality, increases health risks, reduces street-level comfort, and negatively affects daily urban experiences. Car-dependent urban forms and inadequate public transport exacerbate these impacts. The study concludes that addressing vehicular pollution requires integrated urban and transport planning approaches, including public transport strengthening, transit-oriented development, non-motorised transport promotion, and demand management measures to enhance the overall quality of urban life.*

***Key Words***: **Vehicular Pollution, Urban Livability, Air Quality, Transport Planning, Public Health, Indian Cities**

## 1.INTRODUCTION

Vehicular pollution has emerged as a major environmental and urban livability challenge in rapidly urbanising cities. The growth of private motor vehicles, coupled with inadequate public transport systems, has led to increased emissions of particulate matter and gaseous pollutants. Road transport is a key contributor to urban air pollution, particularly $PM_{2.5}$, $PM_{10}$, and $NO_2$, which pose serious risks to human health.

Beyond health impacts, vehicular pollution affects the overall quality of urban life by reducing walkability, increasing commuting stress, degrading public spaces, and disproportionately impacting vulnerable populations. Understanding these impacts is essential for integrated urban, transport, and environmental planning.

## 2. NEED OF THE STUDY

Indian cities are witnessing rapid growth in private vehicle ownership due to urban sprawl and weak public transport systems. Studies indicate that vehicular emissions contribute nearly 30–40% of urban air pollution in major Indian cities. While existing research largely focuses on air quality or health impacts, limited attention has been given to the broader effects of vehicular pollution on urban livability and everyday experiences.

There is a need for a planning-oriented and integrated study that links vehicular pollution with quality of urban life parameters such as comfort, mobility, safety, and equity.

## 3. AIM AND OBJECTIVES

### Aim

To study the impact of vehicular pollution on the overall quality of urban life.

### Objectives

- To study the nature and extent of vehicular pollution in urban areas
- To analyse the impact of vehicular pollution on key parameters of urban quality of life
- To examine national and international experiences related to vehicular pollution
- To review government policies and programmes aimed at reducing vehicular pollution.

## 4. SCOPE AND LIMITATIONS

### Scope

- Focus on vehicular pollution from road-based transport in urban areas
- Assessment of environmental, health, social, and livability impacts
- Literature-based study using secondary data

- Case studies of Delhi and Bengaluru
- Planning and policy-oriented analysis

**Limitations**

- No primary data collection or field surveys
- No GIS-based spatial analysis or air dispersion modelling
- Reliance on availability and accuracy of secondary data
- Findings based on selected case studies

## 5. METHODOLOGY

The study is based on a **qualitative literature review** of government reports, research publications, air quality data, and policy documents. Case study analysis is used to examine pollution levels, vehicular characteristics, health impacts, and policy responses. Comparative analysis is undertaken to derive planning insights and recommendations.

## 6. LITERATURE REVIEW

Vehicular pollution has been widely recognised as a major contributor to urban environmental degradation, particularly in rapidly urbanising cities. Existing literature on vehicular pollution can broadly be classified into four themes: **air quality and emission studies, health impact assessments, urban livability and social impacts, and planning and policy-oriented studies**.

### [1] Vehicular Pollution and Urban Air Quality

Several studies by the **Central Pollution Control Board (CPCB)** and **World Health Organization (WHO)** identify road transport as a dominant source of urban air pollution, especially particulate matter ($PM_{2.5}$, $PM_{10}$) and nitrogen dioxide ($NO_2$). Research indicates that vehicular emissions contribute **30–50% of $PM_{2.5}$ and over 70% of $NO_2$** concentrations in traffic-dominated urban areas. Studies by **HEI (2019, 2020)** highlight that Indian cities frequently exceed national and international air quality standards, with traffic corridors emerging as pollution hotspots. These studies establish a strong link between motorisation levels, congestion, and declining air quality.

### [2] Health Impacts of Vehicular Pollution

A large body of medical and environmental health literature focuses on the adverse health impacts of vehicular pollution. Studies by **WHO**, **HEI**, and **CSE** report that long-term exposure to $PM_{2.5}$ is associated with respiratory diseases, cardiovascular disorders, reduced lung function, and premature mortality. Urban populations living near major roads are found to be at higher risk. While these studies quantify health burdens effectively, they often treat pollution as a public health issue in isolation, with limited discussion on broader urban living conditions.

### [3] Vehicular Pollution and Urban Livability

Recent urban studies have expanded the discussion beyond health impacts to include **quality of urban life and livability dimensions**. Researchers argue that vehicular pollution negatively affects walkability, street comfort, public space usage, and daily commuting experience. High traffic volumes increase noise pollution, heat stress, and safety risks, discouraging walking and cycling. **UN-Habitat (2020)** and **World Bank** studies highlight that traffic-dominated urban environments reduce social interaction and disproportionately affect children, elderly populations, and low-income groups, thereby raising equity concerns.

### [4] Urban Form, Transport Systems, and Pollution

Planning-oriented literature establishes a strong relationship between **urban form, transport systems, and pollution levels**. Studies show that **car-dependent, low-density urban development** leads to higher vehicle kilometres travelled and increased emissions. In contrast, compact urban forms, mixed land use, and **transit-oriented development (TOD)** significantly reduce vehicular dependence and pollution exposure. Research from international case studies such as London and European cities demonstrates that integrated land-use and transport planning improves both air quality and urban livability.

### [5] Policy and Planning Responses

Policy-focused studies examine measures such as **emission standards (BS-VI), vehicle electrification, congestion management, and public transport expansion**. While emission norms reduce per-vehicle emissions, studies by **ICCT** highlight that overall pollution reduction is limited if vehicle numbers continue to rise. Literature also suggests that short-term measures like traffic restrictions or emergency action plans improve episodic air quality but fail to address long-term exposure without structural planning reforms.

### [6] Research Gaps Identified

The review reveals that while extensive research exists on vehicular pollution and health impacts, **limited studies adopt an integrated urban planning perspective** linking pollution with overall quality of urban life. Most Indian studies focus on air quality indices or medical outcomes, with insufficient emphasis on daily urban experiences such as comfort, mobility, and social well-being. This gap highlights the need for planning-led research that integrates environmental, social, and spatial dimensions of vehicular pollution.

## 7. CASE STUDY 1: DELHI

Delhi is one of India's largest metropolitan regions and experiences severe air pollution episodes, particularly during winter. With approximately **7.9 million registered vehicles**, dominated by two-wheelers and private cars, vehicular emissions contribute significantly to $PM_{2.5}$ and $NO_2$ levels.

The annual average $PM_{2.5}$ concentration in Delhi (~100 $\mu g/m^3$) far exceeds national and WHO standards. Traffic corridors act as pollution hotspots, directly affecting public health, outdoor activity, and daily comfort. Vehicular pollution in Delhi has led to increased respiratory and cardiovascular illnesses, reduced walkability, and significant economic losses.

Government measures such as **BS-VI emission norms, Graded Response Action Plan (GRAP), metro expansion, and electric bus induction** have shown partial improvements, but long-term exposure remains high due to regional and structural factors.

## 8. CASE STUDY 2: BENGALURU

Bengaluru has experienced rapid peripheral growth and high vehicle ownership, with nearly **10.2 million registered vehicles** and a vehicle-to-population ratio among the highest in India. Two wheelers dominate the fleet, contributing significantly to on-road emissions.

Although Bengaluru's $PM_{2.5}$ levels are lower than Delhi's, $NO_2$ concentrations along traffic corridors frequently exceed standards, indicating strong vehicular dominance. Congestion, low average travel speeds, and limited public transport share exacerbate pollution impacts.

Initiatives such as **Namma Metro expansion, BS-VI norms, electric vehicle policies, and cycling infrastructure** have yielded positive outcomes, but gaps remain in last-mile connectivity and demand management.

**Table -1:** COMPARATIVE ANALYSIS: DELHI AND BENGALURU

| Parameter | Delhi | Bengaluru |
|---|---|---|
| **Vehicle Growth** | High | Very high |
| **$PM_{2.5}$ Levels** | Extremely high | Moderate |
| **$NO_2$ Contribution** | High | Very high |
| **Urban Form** | Dense + regional pollution | Dispersed, car-dependent |
| **Livability Impact** | Severe health & comfort loss | Congestion & mobility stress |
| **Policy Response** | Reactive + regulatory | Infrastructure-led |

## 9. KEY FINDINGS AND INFERENCES

Vehicular pollution is a major contributor to deteriorating urban air quality

- Impacts extend beyond health to livability, comfort, productivity, and equity
- Car-dependent urban forms intensify pollution and exposure
- Public transport and compact development reduce pollution impacts
- Short-term measures are insufficient without structural planning reforms

## 10. CONCLUSION

Vehicular pollution poses a serious threat to the overall quality of urban life in Indian cities. While emission standards and technological improvements are necessary, they are insufficient on their own. A **planning-led approach** integrating land use planning, public transport, non-motorised mobility, and demand management is essential to reduce vehicular pollution and enhance urban livability. Sustainable urban transport planning is key to achieving healthier, more liveable cities.

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