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Analysis Of Transportation Planning System of Chandigarh

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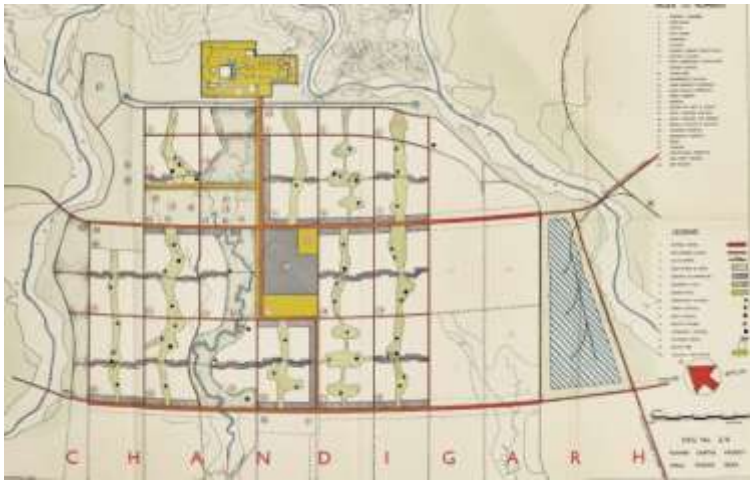
Abstract

This paper critically examines the transportation planning system of Chandigarh, India. It explores the historical foundation of the 7V road hierarchy designed by Le Corbusier, current traffic challenges, and future strategies for sustainable urban mobility. Drawing upon feasibility studies, government reports, and academic literature, the report highlights the need for integrated multimodal transport solutions, adoption of Intelligent Transportation Systems (ITS), and promotion of non-motorized transport to address congestion, environmental concerns, and accessibility gaps.

Introduction

Chandigarh, envisioned and designed by Le Corbusier, is distinguished by its unique **7V hierarchical road network**, originally conceived as a gridiron system comprising seven categories of roads to ensure order, efficiency, and safety in urban mobility. Over time, however, rapid urbanization and the exponential rise in private vehicle ownership have generated significant congestion and environmental challenges. Effective transportation planning has therefore become essential to preserve mobility, sustainability, and the city's planned character.

This paper synthesizes key research studies to provide insights into the existing transportation framework and to outline strategies for future development. Ironically, Chandigarh now confronts the very issues its meticulously designed master plan sought to prevent. Pedestrians and cyclists, once prioritized, struggle to navigate the city safely as motor vehicles dominate traffic regulations and physical infrastructure. Road widening projects have increasingly encroached upon pedestrian pathways, while open spaces are being repurposed for car parking, undermining the original vision of a balanced, human-centric urban environment.



Original Chandigarh master layout plan

Regional Connectivity of Chandigarh

The city is directly linked to the national capital, New Delhi, through **National Highway 21 (NH-21)**, which passes through Chandigarh and serves as a vital corridor for passenger and freight movement. The highway has been upgraded to a four-lane facility, complemented by the construction of multiple flyovers and bypasses. These improvements have significantly reduced travel time, transforming NH-21 into a fast and efficient travel corridor.

Beyond its connection to Delhi, Chandigarh is also well integrated with the surrounding states of **Punjab, Haryana, and Himachal Pradesh**. Road networks provide seamless access to major towns and cities across these regions, reinforcing

Chandigarh's role as a hub for regional mobility and economic exchange. This connectivity not only supports daily commuting and trade but also strengthens the city's position as a gateway to the northern hinterland of India.

MAP SHOWING REGIONAL CONNECTIVITY

Road network of 7vs within the city

TYPE	FUNCTION
V1	Regional connectors linking Chandigarh to Kalka and Ambala.
V2	Major avenues with institutional and commercial hubs (Madhya Marg, Dakshin Marg, Jan Marg).
V3	Sectoral boundaries for fast vehicular traffic.
V4	Shopping streets within sectors.
V5	Circulation roads inside sectors.
V6	Access roads to houses.
V7	Pedestrian footpaths and cycle tracks through green belts.
V8	Dedicated cycle tracks; buses restricted to V2–V4 corridors.

Present Traffic Characteristics and Problems in Chandigarh

Chandigarh's road network is currently under severe strain due to rapid population growth and the **exponential increase in private vehicle ownership**. The absence of an efficient and reliable public transport system has further accelerated the reliance on personalized modes of travel, thereby intensifying congestion across the city.

The physical limitations of the existing built-up environment restrict the scope for road expansion, creating a mismatch between demand and available infrastructure. Urban expansion into the peripheral areas of the Union Territory, coupled with land use changes, has generated new travel corridors. These developments have resulted in **criss-cross movement patterns** across the city and a sharp rise in inter-sector commuting.

Moreover, the original **7V hierarchical road system and sectoral planning principles** have not been consistently applied during the urbanization of rural areas. Development across regions such as **Patiali ki Rao and Sukhna Choe** has been piecemeal, leading to poor accessibility and fragmented connectivity.

A critical shortcoming is the lack of provisions for **pedestrians and cyclists** in newly developed areas and on high-level bridges constructed over the choes, despite significant commuter reliance on these modes. Encroachment on pedestrian pathways and inadequate non-motorized transport infrastructure have further marginalized sustainable mobility options, undermining the balanced vision of Chandigarh's original master plan.

Key Findings of Chandigarh's Transportation System

1. **Structured 7V Road Hierarchy with Emerging Congestion** Chandigarh's distinctive 7V road system continues to provide a well-organized framework for urban mobility. However, increasing traffic volumes have led to congestion, particularly at major intersections, undermining the efficiency of the original design.

2. **Metro Rail Feasibility and Investment Challenges** Feasibility studies on metro rail corridors demonstrate significant potential to alleviate traffic pressure and enhance regional connectivity. Nonetheless, the implementation of such projects requires substantial financial investment and careful land acquisition planning.

3. **Role of GIS-Based Traveler Information Systems** Advanced GIS-based traveler information systems have been identified as effective tools for optimizing routes, reducing travel time, and improving commuter convenience. Their integration into Chandigarh's transport planning could strengthen real-time traffic management.

4. **Inadequate Public Transport Infrastructure** The current public transport system remains insufficient to meet rising demand. Limited fleet size, inadequate coverage, and lack of integration across modes have contributed to increased reliance on private vehicles, exacerbating congestion and environmental concerns.

Challenges

- Increasing private vehicle ownership leading to congestion.
- Limited adoption of Intelligent Transportation Systems (ITS).
- Financial and land acquisition constraints for metro projects.
- Lack of integrated public transport planning.

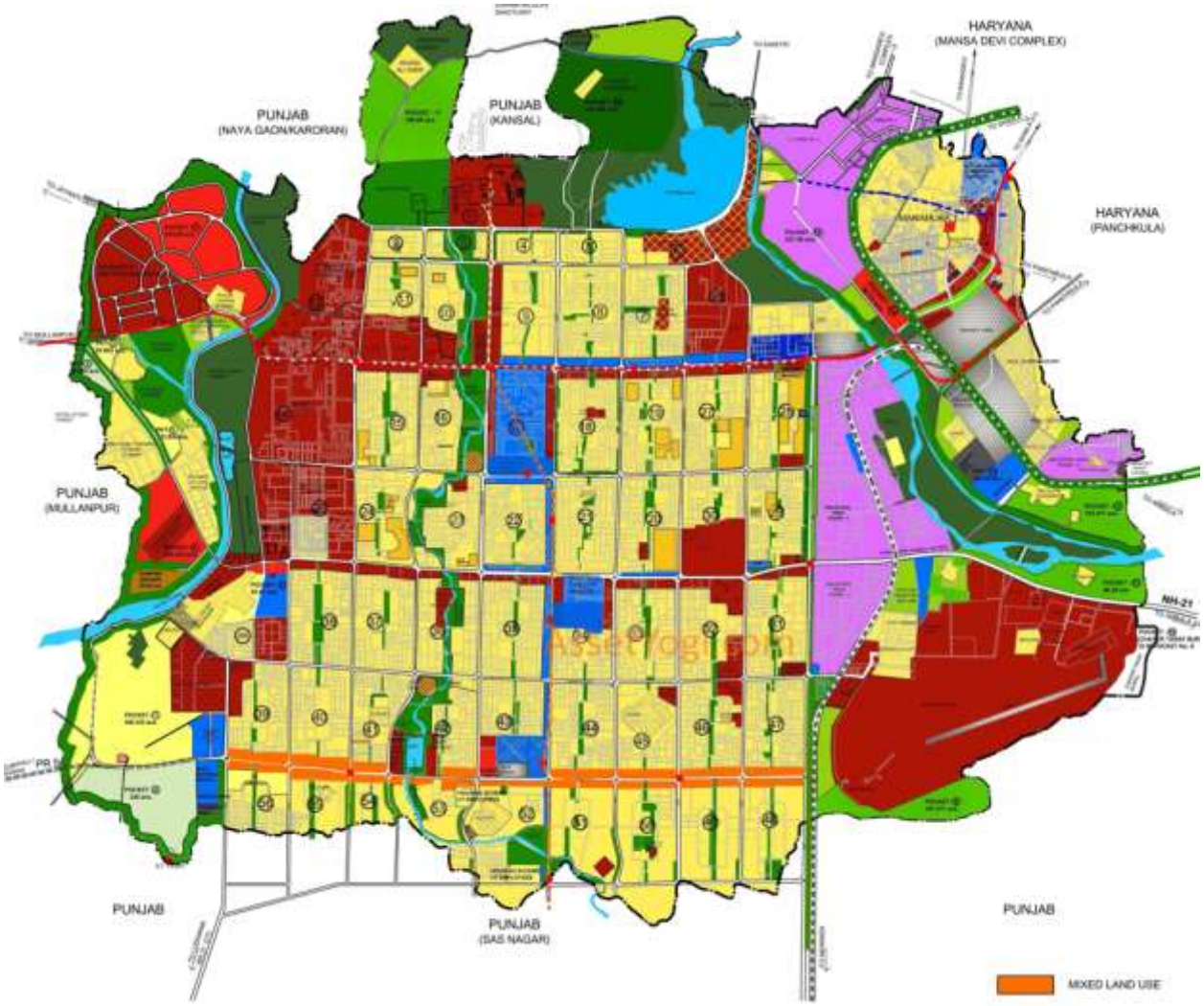
Planning for Future Traffic and Transport in Chandigarh

Future traffic and transport planning in Chandigarh must adopt a holistic and sustainable approach that integrates infrastructure development, technology, and policy frameworks. The following strategies are proposed to ensure efficient mobility and preserve the city's planned character:

- **Implementation of Metro Rail and Bus Rapid Transit (BRT) Systems**: Establishing high-capacity transit corridors will strengthen public transport, reduce reliance on private vehicles, and ease congestion.
- **Deployment of GIS-Based Intelligent Transportation Systems (ITS)**: Real-time traffic monitoring and management will optimize route planning, improve commuter convenience, and enhance safety.
- **Promotion of Non-Motorized Transport (NMT)**: Dedicated pedestrian pathways and cycling tracks will encourage sustainable mobility and provide safe alternatives to motorized travel.
- **Strengthening Policy Frameworks**: Comprehensive policies must be developed to reduce private vehicle dependency, promote energy-efficient modes, and ensure equitable access to transport facilities.

To achieve these objectives, planning must focus on:

- Enhancing **regional connectivity** and intra-city travel across neighborhoods, wards, zones, and satellite towns.
- Ensuring **optimal utilization of facilities** while maintaining Chandigarh's identity as a green, clean, and spacious city.
- Adopting **best practices in sustainable transport**, including energy-efficient and environmentally friendly modes.
- Targeting **60–70% of total trips via public transport**, with provision for one or two modal changes.
- Guaranteeing that **trip origins and destinations lie within 500 meters of public transport terminals or stops**.
- Providing **safe and convenient pedestrian and NMT facilities** throughout the urban area.
- Establishing **secure bicycle lanes and parking facilities** to integrate cycling with public transport systems.
- Developing an **integrated urban land use and transport system** to improve accessibility to employment, education, healthcare, and other essential services.
- Incorporating **Smart City vision planning** and **AI-based traffic control systems** for intelligent mobility management.
- Constructing **bypasses around Chandigarh** to divert through traffic and protect the city's core from unnecessary vehicular load.



Perspective plan of Chandigarh

Components Within Chandigarh Urban Complex

- **Metro System and Bus Rapid Transit (BRT)**: High-capacity corridors to provide reliable and efficient mass transit.
- **City Bus System**: Augmentation of the bus fleet, development of modern bus terminals, shelters, and additional depots to improve service coverage.
- **Inter-city Bus Terminal**: Strengthened facilities to support regional passenger movement.
- **Road Infrastructure and Parking Facilities**: Upgraded road networks and structured parking solutions to complement public transport.
- **Inter-modal Interchanges**: Nodes enabling smooth transfers between metro, BRT, buses, and non-motorized transport.
- **Integrated Freight Complexes**: Located outside the urban core to streamline goods movement and reduce inner-city freight traffic.

Components Outside Chandigarh Urban Complex

- **Road Infrastructure**: Expansion and modernization of arterial roads.
- **Bypasses and Road Widening**: Construction of bypasses to divert through traffic and reduce congestion within the city.
- **Commuter Rail System**: Regional rail services to connect Chandigarh with Panchkula, Mohali, and other satellite towns.
- **Extended BRT Corridors**: Strengthening regional accessibility through expanded bus rapid transit routes.

The integrated multimodal mass transport system represents a **transformative step in Chandigarh's urban mobility planning**. By combining high-capacity transit with regional linkages, the system aims to:

- Reduce dependence on private vehicles.
- Enhance accessibility across urban and peri-urban areas.
- Support sustainable growth through environmentally efficient transport modes.
- Strengthen regional economic integration by improving connectivity with Punjab, Haryana, and Himachal Pradesh.

Conclusion

Transportation planning in Chandigarh requires integrated solutions combining infrastructure development, technology adoption, and behavioral change. Sustainable strategies such as metro implementation, ITS deployment, and promotion of public transport can significantly improve mobility and reduce environmental impacts.

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