

Integrated Land Use and Transport Planning

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Abstract - Land use and transportation develop in a parallel way and are connected where land use demands travelling and transportation influences the land use and urban structure and in this pattern the city develops. Urban sprawl, haphazard development and traffic congestion, pollution are one of the main issues of the Indian cities. Through Integrated Land use and transport planning these issues can be rectified and it can be the best solution for the developing cities. ILUTP (Integrated Land Use and Transport Planning) Model can help to make city sustainable, planned development, better connectivity and accessibility and will encourage Non-motorized transport. This study aims to provide an understanding the concept and benefits of Integration of land use and transportation planning model and to understand what can be the strategies to apply the model.

Key Words: Traffic congestion, Mixed land use, TOD, Non-motorized transport, Accessibility, Travel pattern Integrated Land use and Transport Planning, Transport

1.INTRODUCTION

Land use and transport are intricately related. Travelling location and land use have a direct impact on transportation and travel pattern similarly, the travelling location and transport infrastructure have a direct effect on the allocation of land use. The Integrated Land use and transport planning has been considered in India as an effective method to achieve sustainability and in 2006 it has been included in the National Urban Transport Policy. It helps to improve sustainability of urban environment and to minimize the need to commute. Transportation and land use are so inter-related that if one aspect is targeted by the policy it directly impacts the other aspect. (Swamy, Bhakuni, Sinha, & Wilson, Dec 2013)

1.1 Need of Integrated Land use and Transport Planning

According to the planning process in India commercial development have continued to be concentrated in the Central Business District (CBD) due to which residences have shifted outwards resulting urban sprawl and increase in travel distance and travel time.

Urban sprawl encourages haphazard development, greater densities which are bound to encourage the higher use of

private modes, long distance which will lead to traffic congestion, higher fuel cost and more dependency on private vehicles which also encourages pollution and longer trip generation due to which sustainability cannot be achieved.

While planning the city the main focus is on transportation either on land use neglecting its impact on each other which also leads to catalyze urban sprawl and thus increase automobile dependency.. However, to recreate livable cities in India Integrated Land use and transportation planning principles can be implemented.

1.2 Issues and their impact on the cities

Table -1: Issues and their impact on the city
Source: (Swamy, Bhakuni, Sinha, & Wilson, Dec 2013)

ISSUES AND THEIR IMPACT ON THE CITIES	
Issues	Impacts
Increasing population	Sprawl, congestion, inappropriate development
Increasing vehicle ownership	Increase in trip length, travel time, pollution, traffic congestion, more fuel consumption
Urban sprawl	Haphazard development, more reliability on private transport, loss of agricultural lands
Inadequate, inefficient and declining public transport	Poor accessibility, more dependency on private vehicle.
Inadequate infrastructure for pedestrians	Road accidents, pollution

1.3 Benefits of Integrated Land use and Transport Planning

1. **Reduced demand on transportation system:** People may progressively move from automobile to transit when high density, mixed land uses in metropolitan areas and the usage of automobiles decreases resulting in less congestion.
2. **Low costs on travel:** As a result of shorter trips, the use of autos per capita has decreased. This will have an immediate impact on fuel prices, maintenance costs, and depreciation costs.
3. **Less energy consumption:** Because there is less demand for mobility, smart growth reduces energy consumption and improves the level of service on city streets.
4. **Improved air quality:** Emissions reduction. Emissions are proportional to the amount of fuel burned
5. **Expanded accessibility:** The city's destinations are dispersed throughout the city, resulting in longer journeys. Integrated land use and transport planning techniques like TOD allow commuters to access a variety of services by walking or taking public transportation in an acceptable amount of time.
6. **Sustainable use of urban land:** Low-intensity usage in environmentally and culturally sensitive areas; high-intensity uses in areas that can support them. (Swamy, Bhakuni, Sinha, & Wilson, Dec 2013)
7. **Promote public transport and NMT infrastructure:** Increased access to public transportation and to jobs; added health and quality of life benefits from allowing and encouraging more walking and cycling. (Swamy, Bhakuni, Sinha, & Wilson, Dec 2013)
8. **Encourage compact and mix land use:** Helps in reducing the need to travel as a result travel distance and travel time also get reduced.

1.4 Key Elements and factors of Integrated Land use and Transport Planning

Table -2: Elements and factors

Source: (Swamy, Bhakuni, Sinha, & Wilson, Dec 2013)

Elements and factors	
ELEMENTS	FACTORS
Enabling Urban Structure	<ul style="list-style-type: none"> • Settlement size • Density distribution • Mix Land use and activities • Networks
Complete Network and complete streets	<ul style="list-style-type: none"> • Pattern • Completeness • Safety • Accessibility • Equity • Hierarchy
Re-development & Re-vitalization & Transit	<ul style="list-style-type: none"> • Redevelopment of brown field areas • Re-densification of low density areas
Integrated Multimodal Transit Interchanges	<ul style="list-style-type: none"> • Physical integration • Fare integration • Information integration

2. INTEGRATED LAND USE AND TRANSPORT PLANNING STRATEGIES AND PLANNING PROCESS

2.1 Integrated Land use and Transport Planning Strategies

1. Strategy for Non- Motorized Transport:- NMT strategy forbids people to use motorized transport which helps in reducing the traffic congestion and decreases fuel consumption.

- ❖ Create interconnected pedestrian networks and provide walkways.
- ❖ Create lanes for different transport and boulevards.
- ❖ Correct roadway hazards to NMT
- ❖ Use pedestrian-friendly design elements such as street furniture.
- ❖ Integrate cycling with transit.
- ❖ Encourage sharing by providing rickshaw stands and bicycle parking

2. Transit oriented development:- TOD promotes mixed land use that combines amenities that encourage transit riding and maximizes access to public transportation.

- Surrounding transportation stations are densely populated.
- Multimodal integration provides transport option.
- Mixed Land use
- Pedestrian friendly and walk able neighborhoods. (unescap.org)

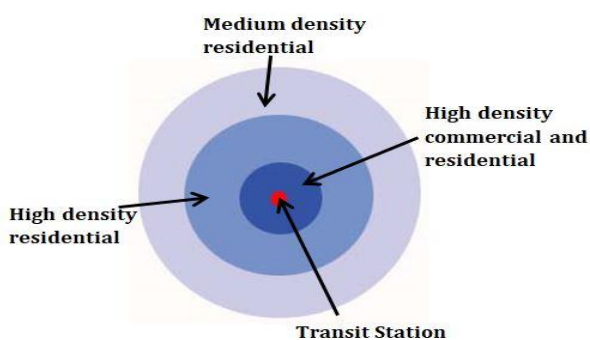


Fig -1: Transit Oriented Development Source: (unescap.org)

3. Complete Network and streets :- A complete network layout with street hierarchy, alternatives path are available to users, Grid roadways with traffic calming techniques improve neighborhood connectedness to the city center, Improved public transportation accessibility and Pedestrian and NMV users' safety and comfort. (Swamy P. S.)

4. Inner city and transit:- Mixed land use with re-densification of low-density areas, Brownfield redevelopment and other types of dereliction, Infrastructure facilities of high quality are provided and Develop the strategies for making the most use of existing urban space and services. (Swamy P. S.)

5. Travel Demand Strategies:- Additional demand management actions are required to boost public transportation modal shares.

- Congestion pricing is a mobility management method that aims to alleviate traffic congestion.
- Managing demand by limiting parking availability or enforcing vehicle restrictions

- Reduced trip length and travel demand are aided by high density and mixed land use.

2.2 Integrated Land use and Transport Planning Process

Integrating land use and transportation so necessitates two mutually supportive processes at one go:

- Organizing a city's physical form and land use pattern to reduce travel demand, trip lengths, and travel times while increasing accessibility, comfort, and efficiency. (Aggarwal, Jan 2015)
- Organizing various modes of transportation, from pedestrian routes to mass transit systems, so that they work well together and allow for the harmonious establishments of land uses around them, resulting in a sustainable city form. (Aggarwal, Jan 2015)

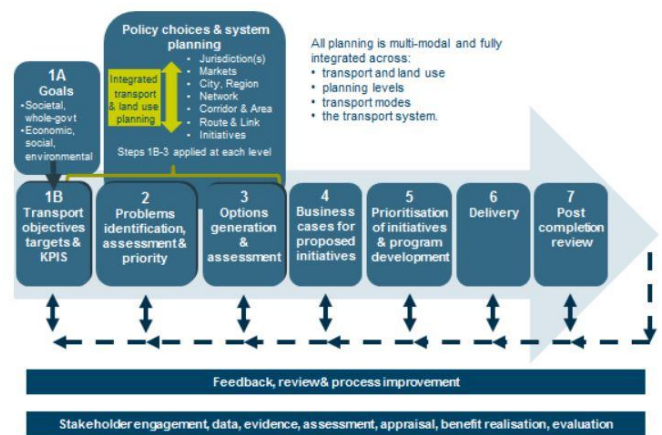


Fig -2: Integrated Land use and Transport Planning Process (Source: Australian Transport Assessment and Planning Guidelines)

3. CASE STUDIES

For better understanding the need of Integration of Land use and Transport Planning there is a comparative analysis of two case studies one with the Integration of Land use and transport planning and one with the conventional transport planning which is automobile oriented planning.

3.1 Singapore, South East Asia

Singapore has excellent connection across all main forms of transportation, including land, air, and water. Because of the country's enormous volume of commerce, transportation of products, services, and people is critical.

Singapore is known for taking a comprehensive approach to urban development. The city planning in Singapore is built on two major principles: integrated land use and transportation planning, and high-density construction grouped around public transportation hubs.

Governments have been effective in reducing traffic congestion over time by establishing creative land use restrictions and demand management techniques.

Efforts to cut down on the necessity for travel:-

Several regional, sub-regional, and periphery centers have been created around key MRT stations to alleviate traffic congestion to and from the Central Area (where the CBD is located) during peak hours.

The distance between work and home has been shortened by decentralizing the commercial and economic activities. Tampines Regional Centre in the East and Novena Fringe Centre in the Central are the two main centers of Singapore

Efforts to improve public transportation and active transportation include:

Singapore's public transportation system, which includes MRT, LRT, and bus service, is extremely efficient. Bus stops are located within walking distance of the residential complexes to guarantee that residents have access to public transportation.

Students, senior persons, and regular commuters are given discounts based on the overall distance travelled.

Most streets now have traffic calming features in place to increase pedestrian and bike safety.

Road and Rail Infrastructure

Singapore spends a lot of money on public transportation infrastructure to improve accessibility and mobility. Between 2005 and 2014, upgrades in rail and road infrastructure were implemented. The city's land transportation infrastructure currently covers around 12%

of its total land area, which is a crucial indicator of its accessibility and connectivity.

Facilities for Commuters and Pedestrians

Singapore has pedestrian and commuter infrastructure. Bus stations, overhead bridges, foot bridges, taxi stands and the length of covered link ways have all been significantly increased throughout the years. These infrastructures are critical for making public transportation and active transportation modes safe and convenient.

Peak Hour Traffic

One of the main objectives is to alleviate traffic congestion on the road network. In 2014, the average peak hour speed on motorways was 64.1 km/h, while arterial routes were 28.9 km/h. Over time, the average speed on both highways and arterial roads has increased marginally. This demonstrates that Singapore's initiatives for Integrated Land use and Transport planning were successful in reducing traffic congestion on the roads.

Conclusion

Cities can use Integrated Transportation and Land Use Planning to achieve their sustainability goals.

Creating high-density mixed land uses near residential complexes reduces the use of automobiles while also boosting active transportation, yet focusing just on one aspect of land use has no effect on travel behavior. As a result, it's critical to comprehend the interrelationships between diverse land use considerations and their implications for transportation

3.2 Mirpur, Dhaka Bangladesh

Mirpur Road is an important part of Dhaka's transportation network. The study area was picked from Azimpur to Mirpur Technical, which is approximately 7.4 km long. It attracts visitors from all across Dhaka. Because of its high degree of accessibility to different zones of Dhaka city, people are forced to choose Mirpur road from the transit network. The Nilkhet crossroads of Mirpur road is an important part of Dhaka's transportation infrastructure. The road goes parallel to the Dhanmondi neighborhood. As a result, it is clear that Mirpur Road plays a vital role in Dhaka's transportation system.

Mirpur Road's Characteristics

Dual carriageways on the city's major roads
 Roads having frequent access to mix development zones on the side of the road. Commercial land uses (educational institutions, hospitals, retail malls, and restaurants) predominate in areas with direct access from Mirpur road. The trip rate is highest in residential and commercial areas, with private transportation being the most common mode of transportation, and the population in that region is constantly growing.

Conclusion

In this case study there is a dominance of commercial and residential land use which fascinates vast traffic congestion mainly at the peak hours which results in traffic congestion As a result travel time increases. The main in that area is that there is no proper balance of land use to compensate each other. To reduce the traffic the development of commercial and educational activities should be avoided and should promote balanced land use and transportation by taking effective measures.

4. COMPARATIVE ANALYSIS OF BOTH CASE STUDIES

Table -3: Comparative Analysis of Both case studies
 (Source: Analysis done by author)

COMPARATIVE ANALYSIS	
Singapore	Dhaka
Implementation of Conventional Transport	Execution of Integrated Transport and land use Planning
Automobile Oriented Planning	People centric Planning
More dependency on cars	Less use of automobile vehicles
Congested Cities	Sustainable Cities
Improper development of land use results in improper development and also affects the ease of transportation	Harmonized relationship between Land use and Transportation and creates balanced development

No Implementation of strategies for Travel Demand	Implementation of strategies for Travel Demand
Huge time loss due to traffic congestion	Reduces travel time and encourages smooth commuting
Stigmatized alternated modes	Encourage alternative modes
Sub-urbanization	Dense, mixed and cantered residential areas

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