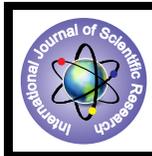


Reinforcing Land-use Transportation interface by planning for Transit Oriented Development: a case study of Nagpur



Engineering

KEYWORDS : Transit Oriented Development, Transportation Land-use interface, Urban Sprawl

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ABSTRACT

Nagpur is the second capital of Maharashtra and serves as major commercial, industrial, educational, transportation and medical center. Due to concentration of social, economic, educational and administrative functions in the city its degree of primacy is ever increasing which has resulted in traffic congestion, unorganised development, reduction of green areas, accelerated and haphazard urban sprawl. The alarming growth of motorized vehicle in Nagpur has jeopardized the urban transportation system. According to Nagpur Municipal Corporation's environment report 2008-09 cities' air is unsafe to breathe all year round. It can become a major dampener to economic growth and cause quality of life to deteriorate. This paper investigates the existing urban issues of Nagpur which prevent Transit Oriented Development and explains how TOD can address the above mentioned problems and further it gives guidelines on reinforcing transportation land use interface.

Introduction

Nagpur is also known as orange city and is located at the geographical center of India. After Mumbai and Pune it is the third largest city in the state of Maharashtra. It serves as second capital of the state and is major commercial, industrial, educational, transportation and medical center. Almost 47% of Maharashtra state power is generated in and around Nagpur.

Table 1
Degree of Primacy of Nagpur in the District

Year	Compared to the 2nd largest city
1981	18.10 times
1991	20.66 times
2001	24.32 times

Source—"A study of urbanization in Nagpur district" ITPI journal, Kirti D. Bhonsle

The primacy of the city is ever increasing due to concentration of all the higher order facilities. Therefore it acts as a magnet retarding the growth of neighbouring areas by preventing the forces of urbanization to be directed into an organized and planned pattern.

There is requirement of more building because of increasing urban population and probably the new development would creep across the city limit, leading to wild land – urban interface because of this deforestation will be carried on a massive scale. This may lead to reduction in rainwater absorption, loss of traditional land practices, agricultural and forestry jobs.

If efficient transportation options, infrastructure, quality of life and commercial needs are not taken into consideration it may accelerate urban sprawl making city more auto dependent. In absence of strong land use and transportation interface Indian cities largely remain "Car-oriented". If we do not learn from our mistakes then in future Nagpur will have to go through severe mobility crises therefore we have to look for paradigm shift where people can start considering and preferring the use of public transport. This requires policy, a planning and urban design intervention which is called as Transit Oriented Development (TOD).

Transit Oriented Development

TOD refers to residential and Commercial Centres designed to maximize access by Transit and Non motorized transportation, and with other features to Encourage Transit Ridership. A typical TOD has a rail or bus station at its center, surrounded by relatively high-density development, with progressively lower-density spreading outwards one-quarter to one-half mile, which represents pedestrian scale distances. (Morris, 1996; Renne, 2009).

The Study Area

Maharashtra Govt. has approved Nagpur Metro Rail. There-

fore there is need for TOD in order to reinforce transportation and land use interface so as to encourage people to live near transit and prefer walk and NMT or transit over personal mode of transportation thus helping city grow smarter.

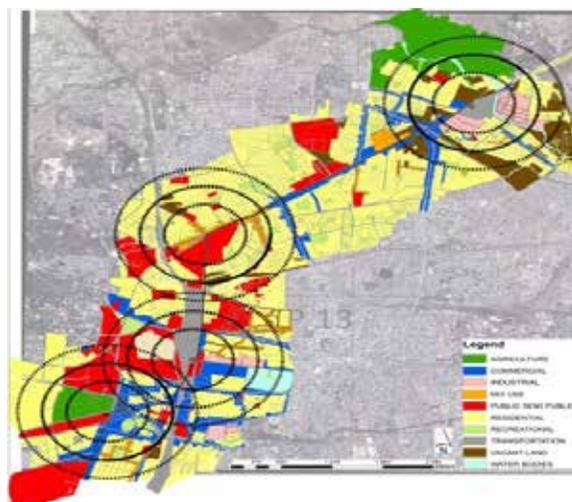


Figure 1: Existing Land Use along proposed Metro rail network in Nagpur

Source: Primary Survey

Principles for promoting TOD

Cervero and Kockelman¹ define using of 3D principles for achieving TOD which are Density, Diversity and Design. It is expected that any TOD project that follows the aforementioned principles shall be successful.

Density

Density is most important principles of TOD because of its far reaching implications. Here density is linked with compact development and other factors such as transport system diversity, regional accessibility, parking management etc which all together have greater travel impact. Hence it should not be viewed as an isolated attribute.

The average population density of Nagpur in 2001 was 95 persons per Ha⁸ which is quite low from TOD point of view. Low density development triggers urban sprawl and sprawl is serious threat to our cities. In order to achieve sustainable development, the growth of peri urban area should be checked and highest possible density should be promoted along the transit corridor so that they do not pressurize the existing systems which are already under huge pressure of Transportation, Sewage, Water supply etc. Transit corridors can prove to be skeleton on which the immigration can be absorbed. TDR can be used as an effective tool in re-densifying the transit corridors.

A maximum up to 2000 m wide radius area with transit station as centre should be designated as TOD influence zone. The density should be high near the transit station and it should gradually taper down with the increase of distance from the transit station.

The TOD influence zone should be divided into three sub zones namely intense, Standard and transition zones. Intense zone should lie within a radius of 500 m from transit station. The minimum FAR and housing density in this zone should range between 3.00 to 4.00 and 600 to 800 du/ha respectively. This zone should be developed as mixed use and pedestrian priority zone.

The Standard zone should lie between Intense and transition zones within the radius of 800 m with transit station as centre. This area should have FAR up to 3.00 and the housing density should vary between 400 to 600 du/ha. Transition zone have

minimum FAR between 1.10 to 2.00 with housing density ranging between 200 to 400 du/ha.

Diversity

Diversity allows vibrant mix land use which helps in creating walkable, diverse and complete neighbourhood around the transit stations. Land use diversity can be evaluated in many ways within a community. Two such useful measures includes 'balance of uses' i.e the ratio of jobs to housing units or the ratio of housing units to retail establishments and 'entropy' meaning the probability of similar land uses on adjacent sites.

An analysis of household travel patterns in a sprawling Florida county found that households living in locations most accessible to commercial and employment locations spend, on average, 40 minutes less per day traveling by vehicle than do households living in locations least accessible to commercial and employment locations, thus generating hundreds of fewer vehicle hours per year. (Ewing et al. 1994; Ewing 1995b).

Table 2 Effects of Diversity

Location	Development Mix	Situation	Travel Impact
Ballston Station Area, Arlington, VA, 1960-2002	5,914 residential units Office: 5,721,000 sf Retail: 840,000 sf Hotel: 430 rooms	The Ballston area has been transformed from an automobile oriented close-in suburb into a full-fledged TOD since the Metro Rail station opened in 1979.	The walk mode share of access/egress for the station in 2002 was 67% of about 22,000 average daily entries plus exits.
Village Green Arlington Heights, IL, 2001	250 condominiums Office: 17,000 sf Retail: 53,000 sf	A big grocery store is within walking distance. One of several downtown redevelopment projects.	17% residents report commuter rail as their primary commute mode.

Source : Evans et al. (2007)

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The mix land use along the corridor and TOD impact zone shall help in generating transit ridership both ways all round the day. It will also allow residents to walk to shops and services, and it allows employees to take transit to work, since they can do without a personalized motor vehicle during the day thereby saving money on fuel and subsequently there shall be reduction in pollution level in the city.

Design

Places should be designed carefully keeping the needs of people in mind within TOD communities. Whether cycling, catching a bus, walking, using a mobility device or pushing a stroller, people belonging to all age groups and abilities should be able to enjoy and access a comfortable, inviting, delightful and safe public realm.

Cervero and Kockelman (1997) examined urban design strategies that a 10% improvement in walking quality could yield a 0.09% reduction in SOV travel for non-work trips, corresponding to a reduction of 33 pounds of CO2 per household per year.

Urban Design is neglected sector in Nagpur. The pedestrian pathways are either missing or discontinuous at places along the major roads or there is scope of doing so. The existing ones cannot be used owing to presence of utilities lines like electric poles, transformers encroachment by street vendors, garbage disposal on road sides which poses an obstruction and spill over of pedestrian on road is also observed causing difficulty in pedestrian movement.

The construction of solid boundary wall takes off eyes from the streets and makes the streets unsafe for people when it turns deserted because there is no one from inside the building looking on to the streets. In the absence of adequate sanitation facility in most of the Indian cities these boundary walls become urinals

for men and women find it extremely irritating and embarrassing to walk across the boundary walls. The solid boundary wall can be a fence instead so as to allow visual communication. If it is not possible to demolish the boundary wall, then some hawk-er zone should be planned adjacent to it overlooking the streets so as to keep place safer, vibrant and cleaner.

There should be landmarks around station areas as it helps in creating notable places and aid in local way finding. Transit station and other significant buildings with prominent design elements make an area more memorable and attractive. The visual gravity created by important features such as a community building, public art, the station or monument helps in terminating the sight lines and thus the area generates splendid views and vistas.

Conclusions

Nagpur is growing at a faster rate which has resulted in uncontrolled urban sprawl, loss of farmland, severe traffic congestion and worsening air pollution. In order to address these issues and have sustainable development, it is necessary to implement TOD project in the city.

TOD helps in increasing transit ridership and reducing the use of personalized motorized vehicle. The reduction in use of private motor vehicle helps in lowering traffic congestion, environmental pollution, and travel expenditure. Less dependency on personal automobile also helps in reducing sprawl, traffic accidents and dependency on foreign oil which greatly reduces environmental destruction. It creates better places to live, work, and play. TOD looks for gradual life style shift which has to happen if we want to survive as a city. In the long run the project should be developed as Transit Oriented Corridor to Transit Oriented Metropolis so as to have sustainable urban development.

REFERENCE

1. Bhonsle, K. (2010). A study of urbanization in Nagpur district. Institute of Town Planners. | 2. Cervero, R. (2000). Transport and Land Use: Key Issues in Metropolitan Planning and Smart Growth. Berkeley: Earlier Faculty Research. | 3. Cervero, R. (2006). Public Transport and Sustainable Urbanism: Global Lessons. Science Council of Japan. | 4. Cervero, R., & Kockelma, K. (1997). Travel demand and the 3Ds: Density, diversity, and design. Elsevier. | 5. Chen, X. (2010). PROSPECT OF THE TRANSIT-ORIENTED. MANAGEMENT RESEARCH AND PRACTICE. | 6. Delivering the 'D' in transit-oriented development: Examining the town planning challenge. (2012). Journal of Transport and Land Use . | 7. FRANK, L. D., & PIVO, G. (1994). Impacts of Mixed Use and Density on Utilization of Three Modes of Travel: Single-Occupant Vehicle, Transit, and Walking. TRANSPORTATION RESEARCH RECORD. | 8. Global Scientific, I. (2010). Environment Status Report. Nagpur: Global Scientific, Inc. | 9. Jacobson, J., & Forsyth, A. (2008). Seven American TODs: Good practices for urban design in. Journal of Transport and Land Use. | 10. McDonell, L., Monroe, M. C., Boles, G., & Mashour, T. (2011). Land Use in the Wildland-Urban Interface: Urban Sprawl and Smart Growth. FOR199. | 11. Mohan, D. (2008). Mythologies, Metro Rail Systems and Future Urban Transport. Economic & Political Weekly. | 12. Randhawa, P. (2012). Delhi Metro Rail Beyond Mass Transit. Economic & Political Weekly.