iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 **Issue:** VII **Month of publication:** July 2021

DOI: https://doi.org/10.22214/ijraset.2021.36472

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue VII July 2021- Available at www.ijraset.com

Concept of Transit Oriented Development (TOD) and Implementation: Case Study of Pune

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Abstract: ***India is one of the developing nation and fastest growing economy in the world. India is facing rapid rapid population growth and it rank second in case of population. there is urbanisation going on so people are traveling to city for better life style, result in in stress on basic amenities, life style , employment ,housing and some other basic needs .Transit Oriented Development (TOD) is gaining popularity as a tool to achieve sustainable development in india . Transit oriented Development presents unique opportunities for indian city indian cities cities to meet challenges of the urbanization, inequity, quality of urban realm and climate change. Transit Oriented Development (TOD) include mix land use , transportation , street design, employment, green space etc. Transit Oriented Development being scientific and integrated development process between transport planinng and land use can be effective tool for attaining sustainable urbanisation . The objectives of this study are to assess TOD plans and proposals in select Indian cities to reveal their expected benefits (Pune). The TOD regulations in cities are being assessed in terms of transit benefits, land use mix, travel demand management measures and the provision of affordable housing . Based on the case of Pune, a planning framework would be developed to arrive at TOD strategies and measures for other Indian cities . This paper studies the concept of TOD and its advantage, challenges and case study.***

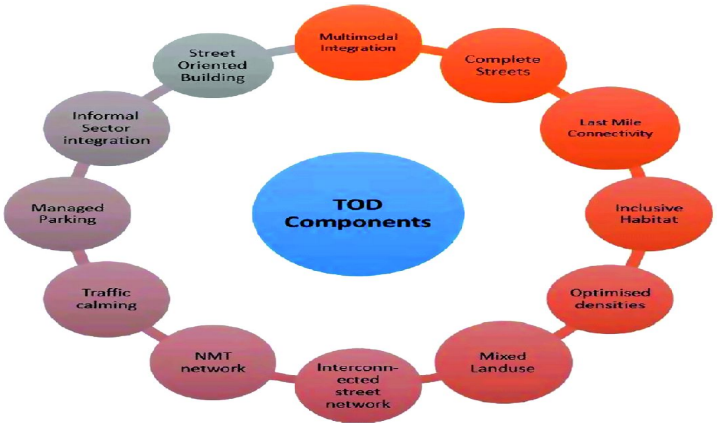
Keywords: Urbanisation, Transportation, Land use, Sustainable

I. INTRODUCTION

There are multiple definitions of TOD which lies within the concept of new urbanism. most popular definitions of the transit-oriented concept came from Peter Calthorpe, an architect and proclaimed urbanist. According to Calthorpe (Calthorpe 1993), TODs are: Mixed-use community within an average 2,000foot walking distance of a transit stop and a core commercial area. TODs mix residential, retail, office, open space, and public uses in a walkable environment, making it convenient for residents and employees to travel by transit, bicycle, foot or car. The transit station should be located in the center of the neighbourhood, within a 400 meter, or 10 minute walk from residents. TOD has a mix of commercial, residential, and institutional developments built to support a public transporting and to encourage non-motor vehicle mobility options, such as biking and walking, within the people . A TOD area could be a radius of as little as 0.5 miles or as much as 1 mile from a transit station .While housing near transit , both affordable and high-end .Transit-oriented development was a response to current conditions a) rising energy prices, b) road congestion, c) climate change, d) shrinking household sizes, e) increasing demand for urban living, f) interest in green building and walkable neighbourhoods.

II. PRINCIPLES OF TOD

Based on the objectives of National Urban Transport Policy, TOD policy defines 12 Guiding Principles :



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The essence of TOD lies in following components

A. Pedestrian And Cycle Friendly Environment

It is the basic component of TOD where strong network of pedestrian walkway to have accessibility to reach essential public domain

B. Connectivity

Providing fast communication to various part of urban area through large volume of traffic without any traffic congestion. It also envisages thee direct and shortest routes to pedestrian and non motorized transportation (NMT)

C. Multimodal Interconnections

In TOD public transportation system and other transportation mode should well integrated with each other . The information and ticket facilities needed at suitable location

D. High density , Mix use

Planning urban space for short direct routes travel time , equity for all section of society through open space , resource standard and social infrastructure for all income groups.

E. Place Making and Safety

TOD helps in creating great urban places by the orientation and structuring plan of urban area to create comfortable ,climate sensitive through effective land use mix use and information network . Planning of buildings with min. setback distances, building to edge with road , without compound walls .

III. OBJECTIVE

To promote the use of public transport by developing high density zones in the influence area, which would increase the share of transit and walk trips made by the residents/ workers to meet the daily needs and also result in reduction in pollution and congestion in the influence area.

A. To provide all the basic needs of job, shopping, public amenities, entertainment , playground with mixed land-use development which would reduce the need for travel.
B. To establish a road network within the development zone for safe and fast and connectivity of NMT and pedestrians between various uses transit stations.
C. To achieve reduction in the private vehicle, traffic and associated parking demand.
D. To empower Economically Weaker Sections (EWS) and affordable housing in the influence zone by allocating a prescribed proportion of built-up area for them in the total housing supply.
E. To provide all kinds of recreational open spaces, required for a good quality of life in the zone area.

IV. TOD PLANNING PROCESS

Although the planning process of TOD for any city is a case specific and needs to address local issues .Some sequential process can be outlined to initiate the TOD planning. These steps are discussed briefly below.

A. Assessment of capacity of Station area.

Development and Mass- transit system: In this step employee and housing pattern around the station is assessed with espect to and the capacity of public transportation volume of station area to reduce the congestion of traffic. Preparation of Station level influence Zone Map and City Level Influence Zone Map will help in planning TOD.

B. Fixing Mix Land Use Objectives

Proper land use objectives are fixed depending upon the existing pattern, architecture, cultural assets and social needs.

C. Creating Cycle Rickshaw Infrastructure

Infrastructure for Non-Motorized Transportation (NMT) system is an essential element of TOD planning process.

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D. Identify TOD Ready Areas

Identifying areas, which are conceptually ready for TOD planning. Such infrastructure. Area needs minimal

E. Affordable cost of Housing and Infrastructure

Using the cost effective approach and sustainable technology to provide more meaningful TOD concept

In adopting the above process, extensive survey of the area on various aspects of development and facilitation needs to be carried out. A critical analysis of the data collected to formulate the TOD planning objectives. Based on the objectives, entire policy is then formulated along with guidelines followed by design and implementation to begin with suitable alternative plans. Finally, evaluation, correction, and updating the policy

V. TOD GUIDELINES FOR PUNE PROJECT

A. Pune

Pune, known as Poona until 1978 is the second-largest metropolitan city in the Indian State of Maharashtra and the seventh most populous city in India, with an estimated population of 7.4 million as of 2020 It has been ranked as "the most livable city in India" several times. Along with the municipal corporation limits of PCMC . Pune forms the urban core of the eponymous Pune Metropolitan Region (PMR). According to the 2011 census the urban area had a combined population of 5.05 million whilst the population of the metropolitan region was estimated at 7.4 million. Pune is also the administrative headquarters of its namesake of district. Pune is widely regarded as the second major "IT hub of India" and the top "automobile and manufacturing hub of India". It is known as the Oxford of the East with the presence of a wide range of educational institutions. India's first indigenously run girls' school was started in Pune by Savitribai Phule . The city has emerged as a major educational hub in recent decades, with nearly half of the total number of international students in the country studying in Pune Research institutes of information technology , education, management and training attract students and professionals from India and overseas.

Recently the Transit Oriented Development (TOD) has been sanction by Maharashtra Govt. along the metro station . the metro area is of around 7,256.4 km2 (2,801.7 sq mi).

The guidelines are as follows:

TOD regulations was sanctioned and inserted in the DCPR of Pune Municipal Corporation vide Govt. Notification dated 05/01/2017.

1) *TOD Zone:* It is the area 500 M. around the proposed Metro station boundary as will be delineated by Pune Municipal Corporation with the approval of the State Government. This distance of 500 m. may be relaxed up to 30 % by the Municipal Commissioner where an! reservation ,/ amenity space within such distance is utilised for the purpose of transportation as prescribed in regulation no.2l(5)
2) *Base Permissible FSI:* It is the FSI that is otherwise permissible on any land with respect to zone shown as per the sanctioned development plan and the relevant provision of the Principal DCPR excluding the TDR and the premium FSI, redevelopment incentive FSI that can be received.
3) *Gross Plot Area:* Gross Plot Area means total area of land after deducting area under reservation or deemed reservation like amenity space if any, area under D.P. Road and Road widening.
4) *Principal DCPR:* Principal DCPR means these DC Regulations sanctioned vital Government Notification dt.05/01/2012 excluding the provisions regarding TOD zone.

B. Maximum Permissible FSI

The maximum permissible total FSI in TOD zone shall be 4.00 including the base permissible FSI, subject to condition that, the additional FSI over and above the base permissible FSI shall be allowed within the overall limit of maximum permissible FSI, as given in the Table below

Sr no	Road width in m	Min. Plot Area in sq .m	Max. permissible FSI
1	2	3	4
1	9 to 12	Below 1000	2.00
2	12 to 18	1000 or above	2.50
3	18 to 24	2000 or above	3.00
4	24 to 30	3000 or above	3.50
5	30 and above	4000 or above	4.00

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Tenement Size For any development or redevelopment within TOD zone, size of tenement shall be minimum 25 sqm and maximum 120 sqm carpet area and out of total proposed tenements, the tenements equivalent to at least 50% of total FSI shall be of a size equal to or less than 60 sqm. except the projects in which rehabilitation of existing tenements is under taken. In case of redevelopment scheme, size of tenement can be relaxed for Rehab Component subject to other provisions of principal DCR However for free sale component 50 % of total FSI shall be utilise for tenements of size equal to or less than 60 sqm These tenements shall not be allowed to be clubbed/amalgamated in any case. If the holder/owner of the proper\ needs to build this 50 % component at some other location within the same TOD zone / circle, the difference between rate of sale of tenements as mentioned in annual statement of rales shall be paid by the developer to the Municipal Corporation as premium.

C. Permissible Mixed Use in TOD Zone

Mixed use in the form of residential and commercial may be permissible on the residential plot in TOD zone fronting on the road width of l2 mt. and above. And mix use on plot / plots in commercial zone in Pune Municipal Corporation shall be permissible as per the principal DCPR . and the maximum permissible FSI under these regulations shall be allowed on the payment of premium. Purely Mercantile building & Information Technology building will be permissible on independent plot subject to payment of premium. For I.T. Buildings the rate of premium for additional FSI up to 200 % shall be as per regulation no.24.10 of principal DCPR and for additional FSI over it shall be as required antler these regulations.

Parking

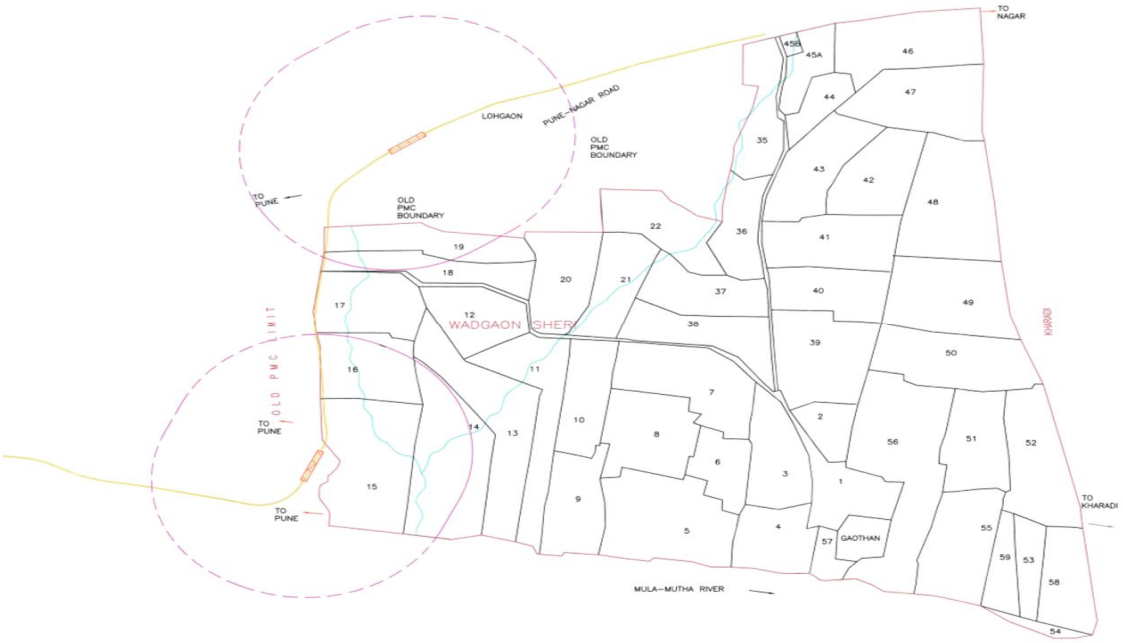
Sr No.	Occupancy	One parking space for every		Transit Oriented Development influence zone	
			Car	Motorcycle	Cycle
1	Residential	For 4 units having carpet area from 25 to40 sq m. For 2 units above 40to 60sq m For every unit above 60 to80sq m. For every unit above 80sq m.	0 0 0 1	1 1 1 1	2 2 2 1
2	Govt. and semi Govt. private business	100 sqm. Carpet area or fraction there of	1	2	2

The layout of building / group housing layout or standalone building on a plot / plots situated in TOD Circle over which construction is started and for which occupancy certificate is not grunted may be revised and balance potential d any may be allowed subject to structural stability criteria's and as per the above provisions subject to following.

1) *Marginal Distance:* The existing marginal distances including front margin may be allowed for higher floor / floors and necessary relaxation to that extent may be granted by the Municipal Commissioner subject to compliance of of fire requirements and fire NOCs by charging hardship premium Ha ship premium is to be decided by Municipal Commissioner. In any case sanctioned existing marginal /front margin distance shall not be reduced,
2) *Free of FSI Items:* For the ongoing buildings for which passages, stairs, lifts, lift room etc. are allowed as free of FSI by charging premium, in such cases these free of FSI items are allowed to that extent only and for the remaining balance potential free of FSI items under these regulations shall be applicable.
3) *Balcony:* For the ongoing buildings for which balconies are allowed as free of FSI by charging premium may be allowed lo that extent only and for the remaining balance potential balcony shall only be allowed as mentioned in Regulation No. 1g.13.

The Amount received as scrutiny fee, hardship premium, premium for additional FSI ect. In TOD zone / circle shall be kept in separate head at Municipal level and shalt be utilised for development of metro project as per directives issued by Government from time to time, These TOD provisions will also be made applicable to other MRTS projects such as BRTS. The scale of FSI availability will be notified later b! the Government for such other projects

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Proposed TOD zones along metro station wadgaon sheri

VI. LIMITATIONS

Presently, many cities across the world are have implemented Transit Oriented development. major concern for successful outcomes of the system is a financial constraint for implementing the planning. In an Indian context, especially, geo-economic and geo political. Following limitations are identified in Implementing TOD in India:

A. Diversity in the culture, rituals, belives and customs
B. Extensive Literature Survey
C. Different Economic and Socioeconomic status of the people
D. Mixed traffic condition and road use Pattern
E. Extensive survey database of the
F. Political Pressure

VII. CONCLUSION

Urbanization of more and more cities in India happens to be a reality in immediate future, which brings an inevitable task providing of the comfortable, convenient, safe, and rapid facilitations. However, sustenance development is under question. Transit Oriented Development is a step towards sustainable development having people-centric, resource conserving, and healthier environmental characteristics can be answer to the inevitable task of facilitation. Proposed development of smart cities in India can be clubbed with Transit Oriented Development Strategies to have greater benefits with ecological balance

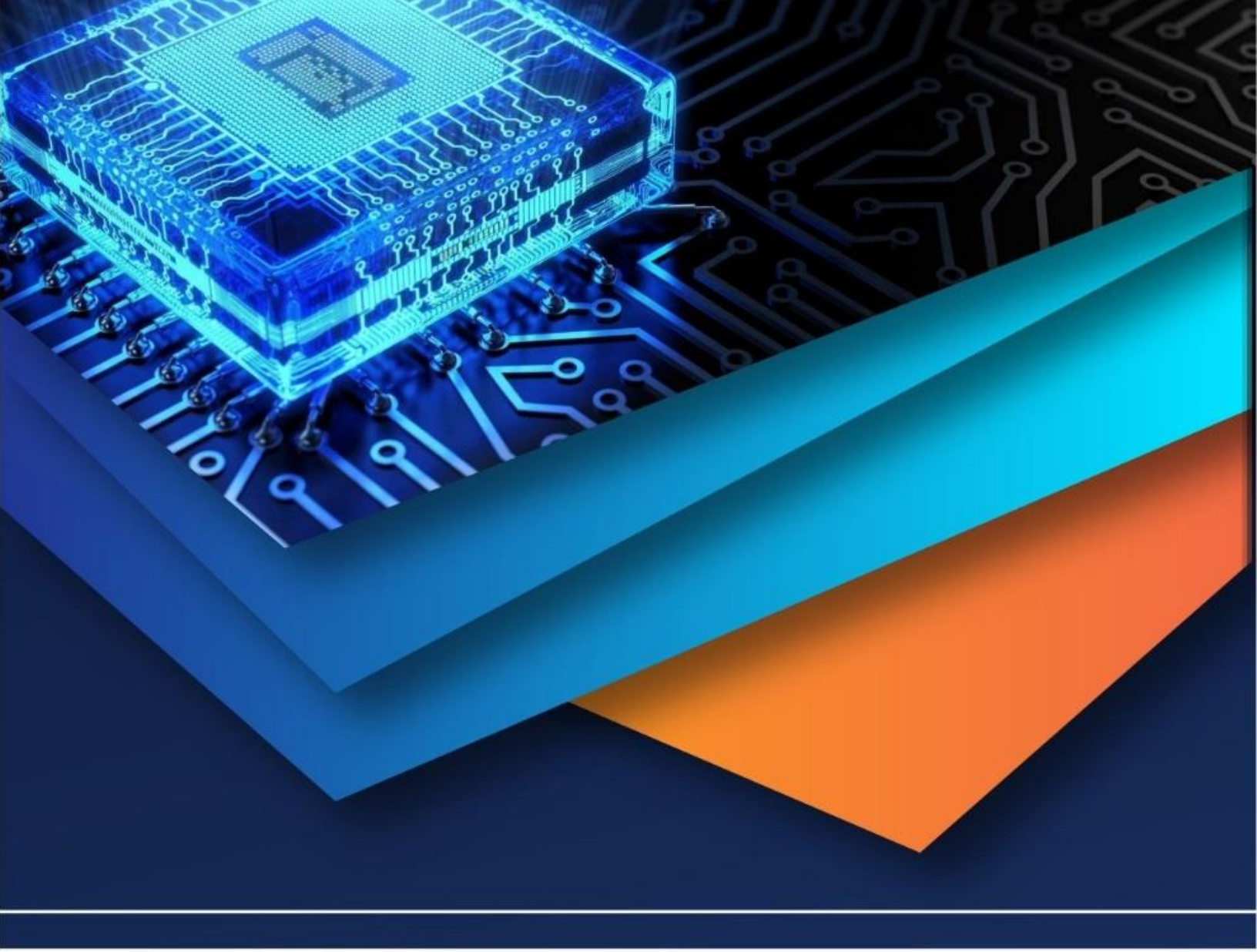
REFERENCE

[1] https://www.pmc.gov.in/en/Tod-developmet-plan
[2] https://pmc.gov.in/sites/default/files/Building_permission/Tod_development_plan/Planning_Unit%209-Wadgaonsheri.pdf
[3] Cervero, R., & Kockelman, K. (1997, Septemeber). Travel demand and the 3Ds: Density, diversity, and design. Transportation Research Part D :Transport and Environment, 199-219.
[4] Cervero, R., Murphy, S., Ferrell, C., Goguts, N., & Tsai, Y.-H. (2004). TCRP Report 102. Washington D. C.: Transportation Research Board.
[5] Carlton, I. (2007). Histories of Transit-Oriented Development: Perspectives on the Development of TOD Concept. Institute of Urban and Regional Development
[6] Delhi Development Authority, Transit Oriented Development - December 2012. Plicy, Norms, Guidelines
[7] Singh Pooja, Chani P S and Parida M. "Sustainable Transportation Strategies: An Approach towards Low Carbon Cities, J. of Envi. Res. & Dev., Vol 7, No 4 April-June 21013.
[8] Bharat Singh, "Measures for Successful TOD in India", The City Fix Blog, August 2013. Wikipedia: http//:en.wikipedia.org/wiki/transit _oriented development

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[9] National Urban transport Policy. (2014, February). Retrieved January 7, 2019, from http://www.itdp.in/wp-content/uploads/2014/11/NUTP-2014.pdf
[10] DPR of Pune metro. (2015, November). Retrieved January 7, 2019, from Pune Municipal Corporation: pmc.gov.in/sites/default/files/DPR_of_Metro_NOV_2015_2.pdf
[11] Smart cities-Mission Statement & Guidelines. (2015, June). Retrieved January 7, 2019, from http://smartcities.gov.in/upload/uploadfiles/files/SmartCityGuidelines(1).pdf
[12] National Transit Oriented Development Policy. (2017, May). Retrieved January 7, 2019, from http://www.indiaenvironmentportal.org.in/content/442287/national-transit-oriented-development-tod-policy/ .
[13] Caves, F. w. (Ed.). (2012). Community Livability: Issues and Approaches to Sustaining the Well-Being of People and Communities. New york: Routledge.
[14] 10. Cervero, R., Murphy, S., Ferrell, C., Goguts, N., & Tsai, Y.-H. (2004). TCRP Report 102. Washington D. C.: Transportation Research Board.

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