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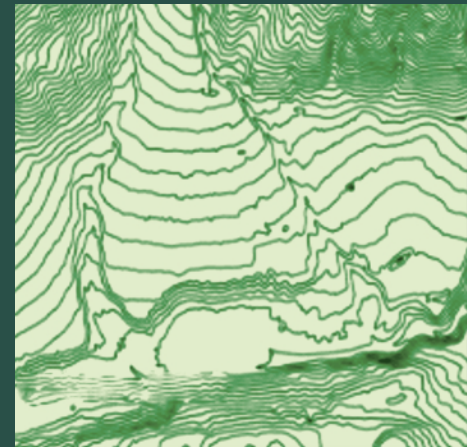
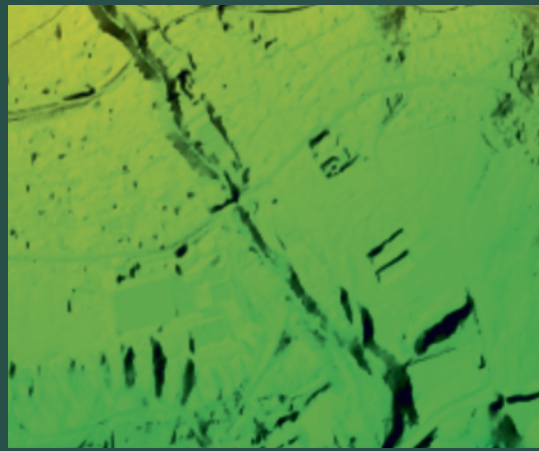
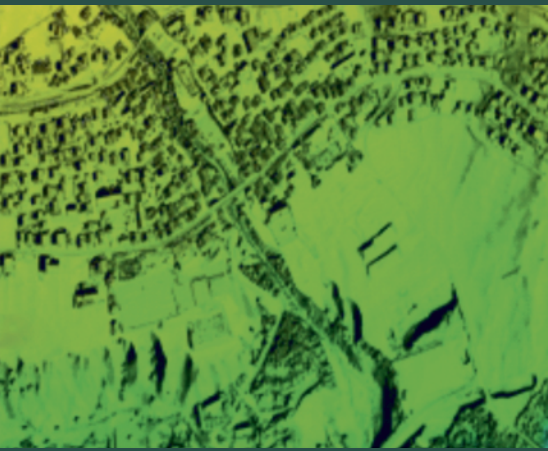
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**Slum Redevelopment, Transit Oriented Development,  
Transferable Development Rights, Financing Urban Rail,  
GIS - a Tool for Master Planning**



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## Editorial

*This issue of ITPI-J focuses on policies related to improvement of slums, planned development of peri-urban areas and airports oriented development. It also presents papers on innovative tools and techniques like TOD, TDR, GIS, for spatial planning and development and resource mobilisation through value capture financing.*

*Taking the case study of Cuttack, the commercial capital of Orissa, Kar and Rajput, in their paper titled 'Assessing the government Interventions for Slum Redevelopment'; present an appraisal of the government interventions for slums. They evaluate schemes like VAMBAY, RAY, IHSDP and PMAY on qualitative and quantitative indicators. Examining the issues, problems and potentials of these interventions of the government, they recommend city-level strategies for prevention and improvement of slums including disaster resistant integrated habitat development.*

*In their study on 'Emerging Residential Landscape in the Peri-Urban Areas', Shanthala and Raj observe that provision of serviced land is a perpetual problem within the continuously transforming peri-urban areas around large cities. They also highlight that the mechanism adopted for such transformation guides the pattern of new residential landscapes; and the provision of social amenities, parks, and open spaces depends upon the size of layouts. Taking the case study of Arshinakunte village within Nelamangala Planning Authority limits of peri-urban Bangaluru, the authors analyse the institutional engagement in transformation of agricultural land to residential use. As the way forward, they recommend micro-level planning in defining and identifying land allocation for roads and social amenities, as well as improvement in the institutional processes to promote planned development of peri-urban areas.*

*Bansal and Sen in their joint paper 'Airport-Oriented Development and Regional Connectivity', observe that airport is an infrastructure that boosts urbanization and globalization. In most Indian cases, airports are placed outside the city with vast unplanned area left between them resulting haphazard growth. The authors review the Ude Deshka Aam Naagrik - Regional Connectivity Scheme (UDAN-RCS) of Government of India with the objective of letting the common citizen of the country fly. The study provides an understanding of urban structure for Tier-II cities with an airport and recommends an airport-oriented-development approach.*

*There are four papers on innovative tools and techniques. Ramulu, Sankar and Randhawa, in their joint paper 'Challenges of Transit Oriented Development in Indian Cities', observe that TOD is an innovative approach that promotes sustainability, livability and equity which is being advocated by various policies including National Urban Transport Policy (2014), National TOD Policy (2017) and Metro Policy (2017). The authors discuss the challenges of TOD in Indian cities with respect to urban development challenges, master plans, development control regulations, institutional issues, and financing, and recommend the way forward to promote TOD.*

*Transferable Development Rights (TDR) as a policy tool for strengthening infrastructure development is presented, in their joint paper, by Srinivas, Dhandhanian and Srivastava. The authors discuss the concept of TDR and the efforts of the State Governments to incorporate its provision in their respective Development Control Regulations. They*



conclude that TDR is a flexible tool for effective conservation of buildings and sites, urban renewal, and growth-management in cities.

Geographic Information System (GIS), for master planning, is discussed by Shukla. In her paper she observes that GIS technology acts as a tool for planning, and integrating different sources of data, spatial and non-spatial, into different layers. She concludes that GIS supports preparation of thematic maps required for spatial analysis including land suitability, buffer analysis, heat islands analysis, and geographic spread. GIS helps in increasing the pace of preparation of master plans as well as micro-level plans. The crowd sourcing apps also helps in incorporating the public opinions in the master planning process.

Aryan, in her paper defines the Land Value Capture (LVC) as a type of innovative public financing mechanism where the increases in land values, generated by a new public infrastructure investments, are captured through a variety of mechanisms such as land related tax, betterment charges, tax increment financing, air rights sale, and property development, to pay back such investments in fully or in part. She observes that the Land Value Capture finance is rapidly acquiring global legitimacy and recommends that both the Development Based Land Value Capture (DBLVC) and the Taxation Based Land Value Capture (TBLVC) be used as an innovative source of funding for expensive urban transport projects.

Neelam, in his paper on 'Policy recommendation for development of charging infrastructure and vehicle registration process of E-rickshaw', highlights that the E-rickshaw are eco-friendly, more efficient and generate employment. In a very short span of time, E-rickshaws have outnumbered the auto rickshaws. There are, generally no rules and regulations to govern this market which causes traffic congestion and unruly driving, and risk to the life of commuters and bystanders. Charging of E-rickshaw is taking place at the residence of the operators with domestic connection. He recommends that E-rickshaw market needs to be encouraged and regulated with provision of strategically located public charging stations.

Gangopadhyay and Gupta, in their paper on 'Post Pandemic Approach to Urban Planning' focus on environment and argue that adverse environmental impact can be controlled by reducing food-miles through promotion of urban agriculture or locally grown food, implementation of zero-waste policy, rethinking of transportation modes and support of legislation.

Dr. S. K. Kulshrestha  
Editor and Secretary Publication, ITPI



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# Airport-Oriented Development and Regional Connectivity Scheme: Review of Indian scenario

Sunny Bansal and Joy Sen

## Abstract

*Urbanization and globalization are the key driving forces today. In India, unplanned urbanization results in urban sprawl leading to significant changes in peri-urban landscape. Among various factors, location of big infrastructures is a major cause for sprawl. Moreover, cities undertake huge infrastructure projects to boost their potential. An infrastructure that boosts urbanization and globalization is airport. In most Indian cases, airports are placed outside the cities and, gradually and haphazardly, city grows to the airport. Airports interest some land-uses to their surroundings and discourage others. Consequently, airport-oriented development (AOD) comes into picture. AOD is a newer spatial notion where airport-related development occurs in the vicinity while efficiently connecting other locations. Spatial interaction between airport and urban planning is a crucial area to explore, specifically for India as it has high growth rates in aviation and urbanization. The study provides an understanding of urban structure with respect to airport for Tier-II cities. It reviews UDAN (Regional Connectivity Scheme). The study proposes AOD as a potential source of adhesion and driver of growth in making more efficient urban systems.*

## 1. INTRODUCTION

“India’s urban growth is so dramatic that it consistently outstrips even the most perspicacious planner’s vision for it.” (Roy, 2009)

Urbanization is the dissemination of the influence and impact of the urban to the rural via altering the peri-urban. Today, more than the half of the world’s population lives in urban area. The rate of urbanization in the developing nations is reasonably high and countries like India are witnessing an unparalleled growth in urban areas. Currently, India is one of the fastest growing and globalizing economies in the world. Due to this globalization drive, the existing towns and cities are expanding to implausible dimensions. Most of the Indian cities are leading to unplanned and haphazard urban sprawl. This unforeseen growth or sprawl is severely impacting the peri-urban regions.

A possible catalyst for this tremendous spreading out is the location of big infrastructure in the region. Many large-scale infrastructural and urban development projects like ring-roads, information technology (IT) parks, airports, real estate ventures, special economic zones (SEZs), and others are planned by

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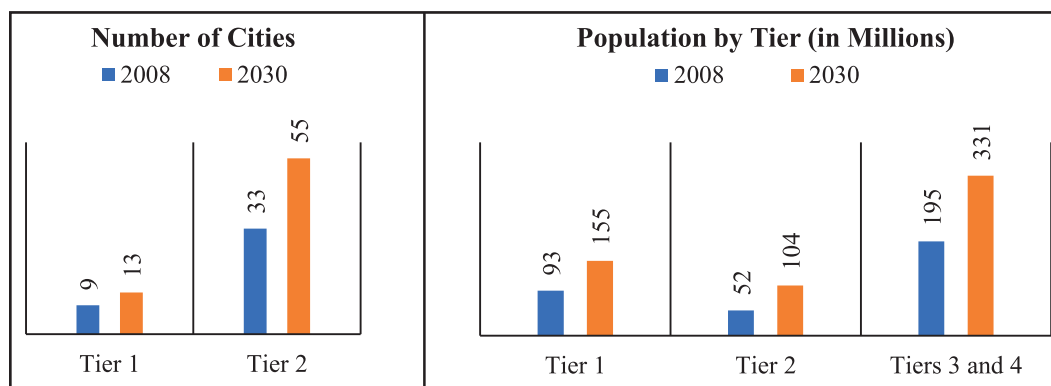
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the policy-makers outside the core-city. And as the city grows, it expands spatially up to these mega-projects, and eventually engulfing them (Lovera, 2015). This growth, towards and around the large projects, is neither coherent with the specific infrastructure it surrounds nor to the city's growth principles in the case of most Indian cities (Brar, et al., 2014). Among such mega-projects, the research focusses on airports. Like many developing countries, airports in India were placed outside the main city. Gradually and haphazardly the city grew to the airport with least coherence between airports and its surroundings. This study attempts to study airport-oriented development (AOD) in detail and seeks to initiate the importance of Tier-II cities (population 1-5 million) and their airports in boosting economy. It reviews the UDAN scheme of Indian Government. UDAN-RCS (Ude Desh ka Aam Naagrik - Regional Connectivity Scheme) is a scheme of Government of India with the objective of "letting the common citizen of the country fly".

## 2. DISCUSSION

It is predicted that by the year 2050, India will be the most populated country in the world (Bansal, et al. 2017). With that, India will have nearly 50% of the population living in cities and demanding for sustainable and resourceful urban systems (Brar, et al., 2014) (Figure 1).

Fig. 1: India's Urban Growth (2008 and 2030)



(McKinsey Global Institute, 2010)

A major growth will be seen in the smaller cities of the country. Majority of this growth is taking the form of urban sprawl. However, the more fitting notion for Indian cities stresses upon compactness, which is contrary to sprawling. Thus, it becomes critical to model and examine the urban sprawl and further, to design policies for better management of resources through dynamic processes (OECD-CDRF, 2011). In the following sections, the research attempts to highlight that how airports are a cause for the urban sprawl in Indian cities. It further portrays the importance of planned development around the airports and the relevance of focusing on Tier-II cities. It then reviews the functioning of RCS in boosting revival and growth for regional airports.





## 2.1 Urban Sprawl and Airports

Most of the Indian cities grew in an unplanned manner, as a resultant of sprawl, which makes it more difficult to decipher the spatial patterns of their urban growth. To channelize this sprawl, a number of concerns arise like the location of future growth centres and sub-centres, distribution of population density, and interlinking of spaces via networks (Brar, et al., .2014). An infrastructure that is a catalyst for urban sprawl and addresses these concerns is airport. In developing nations like India, an airport is a significant reason for the expansion of cities. It can be seen as an expression of the city as it connects and brands the region globally. It accords a blend of localized dis-benefits and regional benefits (McDonough, 2015). Commercialisation and privatization in the air transport sector has further changed the economics around the airports vividly. Today, airport is more than a centre for movement. They have turned into magnets for businesses, urban growth, and global integration (Conway, 1993).

The growth in aviation sector has foremost consequences on the airport's surroundings as well as for the city-region it serves. These emergent dynamics are creating externally well-connected and internally uneven nodes. As a consequence, the relationship between the airport and city is experiencing modifications. Today, airports are more than a mega infrastructure on the city periphery. It has been realized that airports cannot be kept in isolation from their surroundings. Airports interest particular land-uses to their surroundings and discourage others as it impacts the airport's ability to grow. In most Indian cases, airports are placed outside the cities and, gradually and haphazardly, the city grows to the airport (Dey & Grappi, 2015). To plan activities and development around the airports is quite newer concept in India. Many airports round the globe are already developing significant non-aeronautical commercial facilities, services, and revenues. Indian airports are also gradually transforming from mere air transport infrastructure to multi-modal multi-functional enterprises and are generating substantial commercial development. Therefore, a better understanding of planning and development is needed at the city-airport interface in Indian scenario.

## 2.2 Airport-oriented Development (AOD)

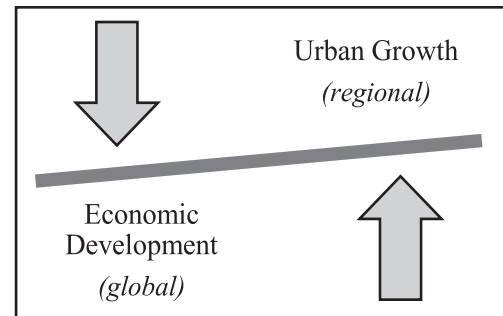
Regional economy has always been a key factor for the air demand growth. And vice-versa also holds true, as air transport itself can be a strategic cause and facilitator for the region's economic growth. Air transport's effect on the regional growth varies by region's size and industrial specialization (Blonigen & Cristea, 2012). India has a great potential in the aviation sector. By the mid-2018, the domestic air transport market in India consecutively recorded its 46th month of double-digit annual growth (17.6% revenue - passenger - kilometres). This makes India the fastest continuously growing aviation market (IATA, 2018). The aviation sector's contribution in Indian economy is also commendable as

it contributes INR 330 billion (0.5%) to the annual national GDP (Oxford Economics, 2011). Besides that, there are major catalytic impacts of airports like augmentation of region's accessibility and generation and improvement of its economic competitiveness (Halpern & Brathen, 2011). With the growth in air traffic, the related commercial activities and the subsequent spatial development clusters around its immediate settings, and at times, in the further locations linked efficiently to the airport (Boloukian & Siegmann, 2016). The airport management, which was more of welfare-oriented, is now focussing on operational efficiency along with significant revolution in the relationship with other airports (Zepezauer, 2012). As a consequence, airport zones have started attracting urban functions and investments and thus, subject to intensified spatial development.

The relationship between airport and planning has always been argumentative because of the concentration and localization of the negative impacts. But the wave of globalization, non-aeronautical revenues, and deregulation of the aviation industry has unleashed new economic potential forces (Hesse & Rodrigue, 2006). This has transformed the scale of planning from airport towards the broader region (Kasioumi, 2015). Today, the larger airport region is "recognized as an increasingly unsettled space caught in the crossfire of different ambitions and is posing considerable challenges for regional planning governance" (Freestone & Baker, 2010). Significant amount of research has been done till date to identify and examine the determinants of regional development but the contribution of aviation sector in it is still sparsely explored. This becomes more interesting in Indian scenario where the airport design and planning is controlled by the Airports Authority of India, a public sector undertaking and owned by the union government of India while the surroundings are managed by the local development authorities, municipalities and village *panchayats*. Thus, airport-oriented development comes into picture (Bansal & Sen, 2018).

Walker & Baker (2010) recommends that an airport city is the ultimate transit oriented development (TOD) strategy, and thus, airport-centric or airport-oriented development comes into picture (Freestone & Baker, 2011). Broadly, AOD has two prominent effects - planned urban growth at regional level and economic development at global level. (Cidell, 2004). AOD is recommended as a groundbreaking urban development solution but little concrete research has been done for the AOD in Indian cities (Freestone & Baker, 2011). AOD is touted as a potential urban development node and growth-driver in making more-efficient urban systems. It is strongly believed to cure the malaise of unsystematic planning and boost the regional economy. The concept of AOD has evolved gradually but still has not found a common universal definition or specifications. A number of researches

Fig. 2: AOD's Major Impacts





are being carried out for the enhancement of the whole notion. Kasarda (2010) refers it as bringing together airport planning, urban-regional planning, and economic development in a synergistic fashion. Development of non-aviation activities and transformation of airport into places of innovation, entertainment, relaxation, and business blends the airport into the fabric of cities, and 'airports in cities' transforms into city-airports (Cyrek & Weltrowska, 2013). Certain desirable conditions allow the formation of areas like large industrial areas with a high concentration of commercial activities in the proximity of airports (Flores-Fillol & Nicolini, 2006). AOD planning principles generate 'economies of speed' and boost aviation-facilitated trade activities by improving air connectivity (Kasarda & Appold, 2014).

### 2.3 Relevance of Tier-II Cities

A universal feature of the historical growth and development of city systems is the evolution of an urban hierarchy with a distribution of city sizes. This has arisen from natural locational characteristics and technological evolution of infrastructure networks such as energy, transport, and telecommunications (Samet, 2013). It should be recognized that while mega cities receive the media attention, it is the smaller cities that make up the majority of the world's urban population (Vojnovic, 2014). Also, middle-sized and small urban areas may be actually those experiencing the highest rates of urban growth. Studies on urban sprawl have, for the most part, focused on large cities and metropolitan areas, however, middle size and smaller cities tend to sprawl as well, perhaps at a greater pace (Shahraki, et al., 2011). In case of India, the ill-effects of unplanned urban growth have done much damage to the Tier-I cities. However, the planners can shape the trajectory of Tier-II cities and ensure that as they expand, they do not emulate urban decay of Tier-I cities. Ideally, India should continue to aim for a distributed model of urbanization through focused approaches to different tiers of cities and foster intercity connectivity (McKinsey Global Institute, 2010). To avoid repeating history, India needs to act preemptively to shape the growth of its Tier-II cities by creating the right policies. These Tier-II cities can be effectively used as test bed for reforms in urban planning (McKinsey Global Institute, 2010).

The airports of Tier-II Indian cities need to be focussed as they also present a special scenario. These airports act as feeder to the bigger airports and are on par with the government's objective of boosting regional air connectivity. Also, these Tier-II cities are the current economic hot spots. They are emerging as new business locations and investment destinations due to the availability of land, opportunities, and government support. The air traffic in India is quite unequally distributed as eight Tier-I cities cater to more than 70% of the country's total annual traffic, with Delhi and Mumbai together catering to 40% national traffic. This huge disparity also motivates to study Tier-II cities' airports in a slight segregation from the airports handling huge traffic to avoid any kind of

shadowing. The study becomes even more relevant for India as the connectivity of airports in India is, majorly, complementary than competitive.

## 2.4 UDAN-RCS

UDAN-RCS (Ude Desh ka Aam Naagrik - Regional Connectivity Scheme) is a regional airport development scheme of the Government of India. The Hindi *termude desh ka aam naagrik* means letting the common citizen of the country fly. India has currently 394 unserved and 16 under served airports. The scheme majorly aims at making travel by air inexpensive and widespread by connecting smaller towns with unserved and under served airports. With this it indirectly aims to facilitate inclusive economic development and air transport infrastructure development in all regions of the country. The scheme has two main modules:

- Developing new regional airports and improving the existing regional airports; and
- Adding a number of financially-feasible, airfare-capped, and new regional air routes by using “Viability Gap Funding” (VGF) from the government whenever needed.

As many as 688 routes have been announced under the scheme so far but, only 232 routes (one-third of the planned) are working in reality. Only 44 airports are operationalized of the unserved and under served 400+ airports till December 2019 (Manish, 2020). The scheme has been endorsed as one of the most ambitious aviation schemes in the world, but, it has failed to take-off as anticipated. Experts have suggested that there are many technical, financial, procedural, and operational issues in the scheme (Table 1). Major issues that are

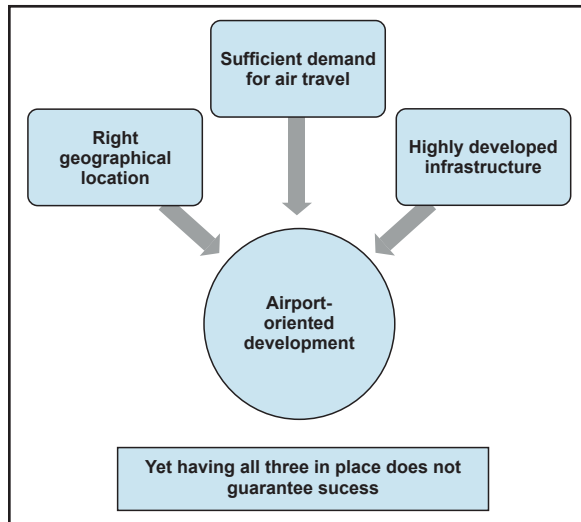
Table 1: UDAN Scheme Timeline

Round	Announcement Date	Routes Awarded	Routes operationalized	Outcome/ Focus
UDAN 1.0	December 2016	128	54	Even operationalised routes became defunct by collapse of Air Odisha and Deccan Charters which had bagged most routes in this round
UDAN 2.0	August 2017	297	106	Shut down of Jet Airways saw some routes failing to take off
UDAN 3.0 (and UDAN 3.1)	October 2018 and February 2019	335	88	Failed routes from round 1 were re-awarded but some airports still not functional
UDAN 4.0	December 2019	NA	NA	Latest round focusses on North East Region, Hilly States, J&K, Ladakh and Islands

Source: (Manish, 2020)



**Fig. 3: AOD Conceptual Planning**



not working in the favour of scheme are delays in readiness and opening of regional airports, no availability of bays in bigger airports, shortage of staff, and high operational costs of smaller airports. Another major fallout is regarding the selection of airports as the prediction of future demand was not done appropriately. Many of these cities lack any major industries, services sector, or any major economic activity. Native traffic and leisure trips can not suffice enough demand at the regional airports (Kaushik, 2017). Thus, more realistic predictions and supportive policies are the need of the hour.

### 3. CONCLUSIONS

Urbanization and globalization are the key driving forces in the world today. A developing nation like India has high growth rates in urbanization and aviation, which in turn boosts globalization. Airport, a catalyst for urban sprawl, connects the region globally. Given the pace of urbanization in India and the growth in airport industry, a huge potential is seen in bringing airport planning and urban and regional planning together. In India, airports are majorly placed outside the cities and, gradually and haphazardly, city grows to the airport. Conventional and rigid planning approaches seem more and more problematic for the dynamism that airports and its region share. Also, the potential of each region and its airport may vary and has to be addressed accordingly. The RCS is failing to create an appropriate ecosystem for the operators of small air crafts that can operate from the majority of the 400 regional airports.

Airport-oriented development is a recent phenomenon for developing nations like India. The research proposes AOD as a newer spatial notion where airport-related development shall occur in its vicinity while connecting other locations efficiently. Fundamental principles towards planning for a more efficient urban system may be:

- Estimation of the current infrastructure capacity and future potential of the airports through augmentation;
- Realistic realization of spatial-economic impacts of airports at regional scale;
- Synergized integration of airport planning with local or regional comprehensive plans, master plans, and community's vision;
- Accurate assessment of air transport network demand at national and international levels;



- Efficient governance framework to facilitate coordination and communication among all the concerned authorities;
- Concern for the immediate and long-term environmental impacts at local and regional level;
- Strategies for economic development and marketing for the airport region and tools to attract and retain investment; and
- Specific solutions like reserving at least one-fourth bays for the regional routes at the bigger airports or major participation of established airlines, etc., need to be planned out.

The research strongly recommends the urgency to review and revise the current approaches and policies that take airport as an alien unit. An innovative approach is required for bringing together airport planning and urban-regional planning in a combined synergized manner. Need of the hour is to develop more meaningful and efficient ways of reading airports and airport-oriented development. This will eventually lead to more ways of understanding contemporary urban-peri-urban-rural agglomeration processes and their planning and governance in the context of the global city-region.

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# Emerging Residential Landscape in the Peri- Urban: A Consequence of Land Use Conversion, Consolidation and Fragmentation

**Shanthala V and Mamatha P Raj, Ph.D.**

## Abstract

*Provision of serviced land within expanding peri-urban areas in response to increasing urbanization levels has been a challenge. The transformation of predominantly rural fabric to urban involve transition of agricultural land to urban uses. The pattern of new residential landscapes depends on the mechanism adopted for the transformation. The paper examines through literature, mechanisms adopted in various contexts to provide serviced land for residential use in urban extensions. The paper analyses the institutional engagement in transformation of agricultural land to residential use in Arshinakunte village within Nelamangala Planning Authority limits of peri-urban Bangaluru. The process of conversion of land use and approval of layout plans are two important process which control the transformation process. The size of land parcels involved in these processes are important since the provisions in the Master Plan regulations correspond to sizes of development. Hence the study identifies the relationship between the institutional processes and the associated land parcel sizes. The implication of the land parcel sizes on the emerging urban fabric is discussed.*

## 1. INTRODUCTION

Increasing urbanization levels are observed over the last two decades across Asian geography and this trend is projected to continue. Asian and African countries would observe an annual percentage increment of 44% in urban population for 2030-2050 period according to World Urbanization Prospects 2018. Telescoping transition, the term coined by Mc. Gee (2007) recognizes the pace of urbanization which would influence the nature of transformation of urban regions. The Asian population which has moved into urban areas in the past 10 years is equivalent to the numbers which moved over a period of 50 years in Europe. This accelerated pace of urbanization process would demand robust planning mechanism to accommodate the influx of new population into urban areas.

India will be adding additional 416 million urban dwellers by 2050 (WUP 2018) which is close to doubling the existing urban population. In the process of accommodating this increment, the urban influence is extending over larger peri-urban region (Allen 2003). It is projected that Indian urban land cover is expected to increase by five times (Angel, et al. 2010) by 2050. Hence it is important to contain urban influence and ensure that the urban expansion taking place is effective in addressing the needs of communities. This research paper identifies the nature of transformation

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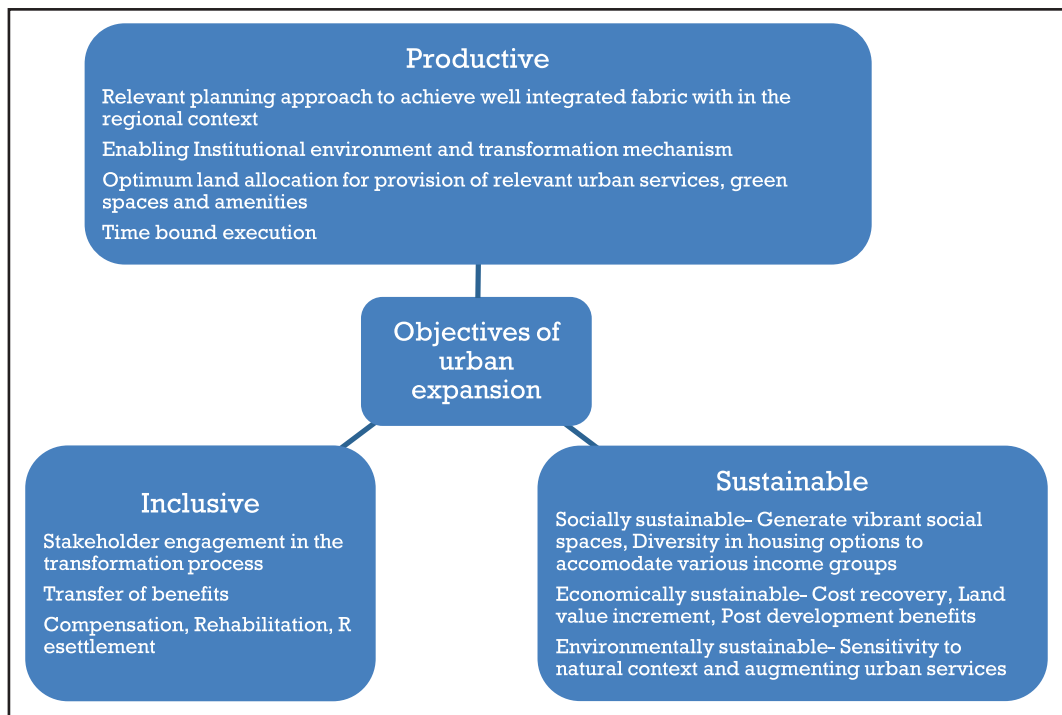


in the peri-urban areas due to emerging residential extensions. The transformation is analyzed in the context of the institutional procedures involved in the process and its implication on the resulting urban fabric.

## 2. PROVISION OF SERVICED LAND FOR URBAN EXPANSION

Peri-urban areas are transforming by incorporating urban uses into a predominantly rural fabric. Provision of serviced land to accommodate urban land uses has been a challenge in most geographies. Urban areas need to systematically expand (Figure 1) achieving objectives of productivity, inclusivity, and sustainability in the urban landscape. (Angel, et al. 2010).

**Fig. 1: Objectives of Urban Expansion**



The provision of serviced land and amenities is governed primarily by the land policy and the mechanism for transformation adopted by the local administrative institutions. Land is a crucial input (TCPO2007) for housing and urban development. The Local institutions regulate the supply of land through the process of conversion from mostly agricultural use to urban land use (TCPO 2007). Provision of physical and social infrastructure also influences the ease of urban expansion.

The prevailing condition in the peri-urban areas significantly influences the process of transformation. The size of agricultural land holding, the intensity of agricultural activity, the socio-economic situation profoundly influences the nature of transformation.



### **3. LITERATURE REVIEW**

#### **3.1 Mechanisms adopted for provision of serviced land for urban expansion**

Various mechanisms have been adopted, in different contexts, to achieve adequately serviced land for urban expansion through definition of physical and social infrastructure components. These mechanisms are examined by highlighting the method of consolidating land and identifying the amenity sites.

#### **3.2 Land Acquisition**

In India, traditionally, land acquisition has been the method adopted by most Urban Development Authorities for urban expansion. Land is acquired stating the “public purpose”, then reorganized and disbursed (TCPO 2007). The aggregated land is parceled by providing necessary physical infrastructure components, green spaces and amenity sites for the projected population and purpose. But this process demands extensive resources in acquiring land and the legal complexities prevent the execution in a time bound manner. Nevertheless, the benefits of this tool may be explored through necessary amendments in the law to rationalise the time and cost through a proactive acquiring authority (NHB, 2016). Though this mechanism has been adopted in various contexts of urban expansion, it has not been effective in providing serviced land at the pace of urban expansion. Amenity sites are designated through the process of reorganizing land.

#### **3.3 Land Pooling**

The Planning Authority engages in a joint venture with landowners, involving pooling land, reconstituting land by incorporating aspects of physical infrastructure amenity sites, parks, and open spaces. The serviced land is redistributed in agreed proportions after extensive consultations. This mechanism was introduced in the colonial regime in 1915 through the Bombay Town Planning Act (De Souza 2018). Land Pooling mechanism has been effectively adopted in the states of Gujrat and Maharashtra to provide serviced land. Preparation of Town Planning Schemes (TPS) is embedded in the Town and Country Planning Act of most states and land pooling mechanism has been adopted to prepare the TPS for urban expansion. Typically, a TPS is prepared for 100-200 hectares involving 100-250 landowners.

#### **3.4 Land Adjustment**

Land Adjustment mechanism involves the local authorities taking the initiative to develop certain parts through obligatory land pooling by landowners. The land is serviced to provide necessary infrastructure and amenities. A percentage of serviced land is returned to the landowners along with proportionate monetary benefits for land contributed. This mechanism is adopted in the provision of urban land for Amaravati, Andhra Pradesh. Due to the involvement of the public



agency, social benefits such as skill development for affected families, pension for landless farmers become part of the schemes (Mathews et.al 2018).

In many other countries, the reorganization of land through land pooling and adjustment for urban uses is practiced as land readjustment. This involves consolidation, readjustment, reorganization, and rearrangement of land (De Souza 2018). Japan and Germany were the first countries to incorporate the principle of land readjustment and have achieved effective urban expansion through this mechanism.

In the German context, land use plan should be in effect prior to commencing the land readjustment project (Linke 2018). It is initiated by designating the name and the boundary of the readjustment project by the local body i.e., the municipality. The maximum area deducted is not more than 30% of the land contribution.

Japan has a history of agricultural land readjustment for productive farming which was assimilated for the purpose of urban expansion. About 30% of urban development in Japan is through land readjustment. Land readjustment is an administrative measure strengthened with appropriate legal framework in Japan. The project boundaries are legally defined and a legal body is established in which land owners are members. The process may be initiated by public executors or private entities. For privately led projects, approval must be secured from 66% of landowners. For government led projects, no such criterion is applicable. Detailed plan is prepared for project implementation along with budget estimate, assessment of subsidies, land for public use and saleable land. On completion of project, finances are reconciled, and adjusted plots are returned to landowners.

### 3.5 Other Mechanisms

In the Indian context, there are mechanisms which have evolved by modifying the common principles of land acquisition, land pooling and land adjustment by certain local planning or governing authorities to control the processes of land transformation.

City and Industrial Corporation of Maharashtra Ltd. (CIDCO) operates with a mechanism of encouraging participation by the landowners through the Navi Mumbai Airport Influence Notified Area (NAINA) Scheme in NAVI Mumbai. The scheme allows landowners to aggregate contiguous land parcels of prescribed sizes. The contributing landowners get the privilege of additional development rights at the cost of surrendering 40-50% of the land owned towards servicing the land parcels. The land retained by the landowners are parceled as layouts developed in specified size range of 4 ha, 4 - 7.5 ha, 7.5 - 10 ha, 10 ha - 25 ha, 25 ha - 40 ha and greater than 40 ha. The NAINA scheme insists on 5% of the



layout extent as designated amenity spaces. Hence the provision of amenity sites depends on the size of layouts formed.

Transferable Development Rights (TDR) is an instrument which can be used by the local authorities to secure land for public purpose. The landowners of these identified plots surrender the designated extent of land to the authorities for public use. In compensation for the same, the landowners secure additional development rights on remaining portions of the land. These development rights may be transferred or traded as TDR in other locations also.

Community Land Trust is another method which involves the original landowners forming a consortium to develop land for urban use. The developed facilities are occupied through long term tenure arrangement. The landowners directly benefit from development and retain the land parcels. The allocation of land for infrastructure facilities and services is controlled by the trust. The adequacy of provision needs to conform to the applicable regulations of Master Plan. Magarapatta Township developed on 430 acre land involved a joint development agreement of 120 farmer families.

Joint Development involves the public entity and private sector collaborating to provide serviced land. There is limited involvement of landowners in this mode of development. Allocation of land for physical infrastructure, open spaces and amenity sites are defined by the private entity with limited participation from the government agency.

### **3.6 Formation of Private Layouts**

In Indian cities and towns which are experiencing increasing urbanization levels, urban expansion is taking place extensively through formation of private layouts. This expansion is sometimes guided by an approved Master Plan for the area which has broad definition of land uses. In the absence of Master Plan, the layouts emerge as piecemeal response to the real estate demand.

The Master Plans are broad brush definition of urban land uses in the growing periphery. Absence of micro-level planning results in lack of optimal layout of road network, inadequate provision of amenity sites and green spaces for the projected population. Zoning Regulations of many planning authorities specify layout size as the criteria for allocation of land for amenities and green spaces. In the absence of institution led land consolidation mechanism, the size of agricultural land parcels has a bearing on the sizes of layouts which emerge. Further the size of these layouts influences the nature of provision of amenity sites and open green spaces.

The process of layout formation involves two important institutional procedures that is conversion of agricultural land to residential land use and approval of layouts formed on these converted lands.



Hence the intent of the paper is to assess the relationship between the size of land which goes for land use conversion and the size of layouts formed. The objective is also to assess the implication of this relation on the emerging urban fabric.

#### 4. METHOD AND MATERIAL

##### 4.1 Context of the Study Area- Bangaluru and its Periphery

Peri-urban Bangaluru is experiencing extensive transformation due to enhanced investments in information technology, biotechnology and manufacturing. This has translated into industrial parks, special economic zones which are dispersed in the city region. The location of new economic activities, educational institutions, residential projects in peri-urban areas has resulted in an active periphery. Enhanced connectivity through concentric and radial road networks has connected the frontier region to the primary city. Bangaluru's periphery is transforming by not only accommodating the demands of a growing urban centre but has also changed patterns due to speculative growth. Sprawl has been an inherent character of the city's peripheral grain. Bangaluru is experiencing unhindered expansion through all the planning periods by extending the limits of influence of the city.

##### 4.2 Study Area

To examine the transformation process, the study area of Arishinakunte is identified in peri-urban Bangaluru. Arshinakunte is situated adjacent to limits of Bangaluru Development Authority to the north - west of Bangaluru city in Bangaluru rural district (Fig. 2 and 3). The planning for Bangaluru city is carried out by the Bangaluru Development Authority (BDA) and the city region by Bangaluru Metropolitan Regional Development Authority (BMRDA). BMRDA has identified 11 Local Planning Authorities to plan for the peripheries of the city which are beyond the limits of Bangaluru Development Authority. The planning by the local planning authorities is in compliance with the provisions of BMRDA's Structure Plan, 2031. Cluster and node strategy is adopted by BMRDA to regulate the urbanization in Bangalore's periphery. The study area is within the urbanizable zone of BMRDA's Structure Plan, 2031 and is located within the limits of Nelamangala Planning Authority (NPA) which was constituted in 1997 by Karnataka State Government conforming to the provisions of Karnataka Town and Country Planning Act. NPA functions with an approved Master Plan for the horizon year 2031.

Arishinakunte is located between the primary city Bangalore and Nelamangala town. It is identified as census town by Census of India in 2011. Census towns are settlements which satisfy the parameters to be urban in terms of population numbers, population density and economy. Since it is not a notified urban area, the administrative system continues to function as a village *panchayat*.

The study area measures an extent of 5.4 sq km (540 hectares) with a total Population of 10,567 people according to 2011 census. The National Highway 4 and an arterial road connecting Bangalore to Nelamangala town divide the study area into three zones. The study area is predominantly residential in accordance with the approved Master Plan, 2031 of NPA.

#### 4.3 Data Collection

The paper examines the transformation process in the study area of Arishinakunte from rural to urban patterns. The transformation is assessed with respect to the evolution of residential fabric from the agricultural lands. The important institutional processes involved in this transformation include the conversion of land use mostly from agricultural use to residential use and formation of residential plots which involve approval of layouts. This in turn defines the pattern of fragmentation.

#### 4.4 The Land Use Conversion Process

The Revenue Department which is part of district administration machinery executes the conversion of agricultural land use (Fig. 4) to non-agricultural use conforming to the provisions of Karnataka Land Revenue Act, 1964. But for all conversions within NPA limits, the Revenue Department

Fig. 2: Location of Study Area within BMRDA Limits of Nelamangala Planning Authority

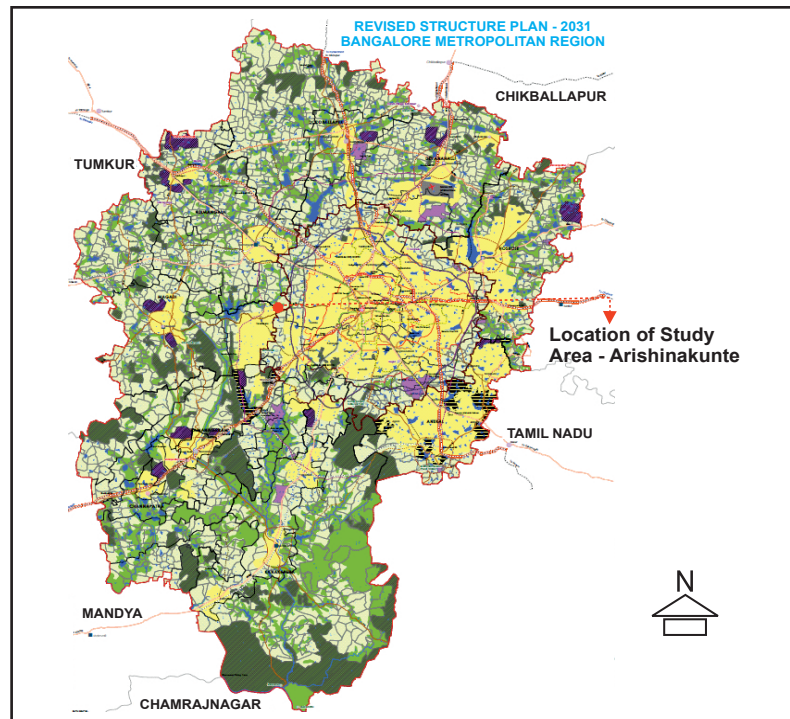
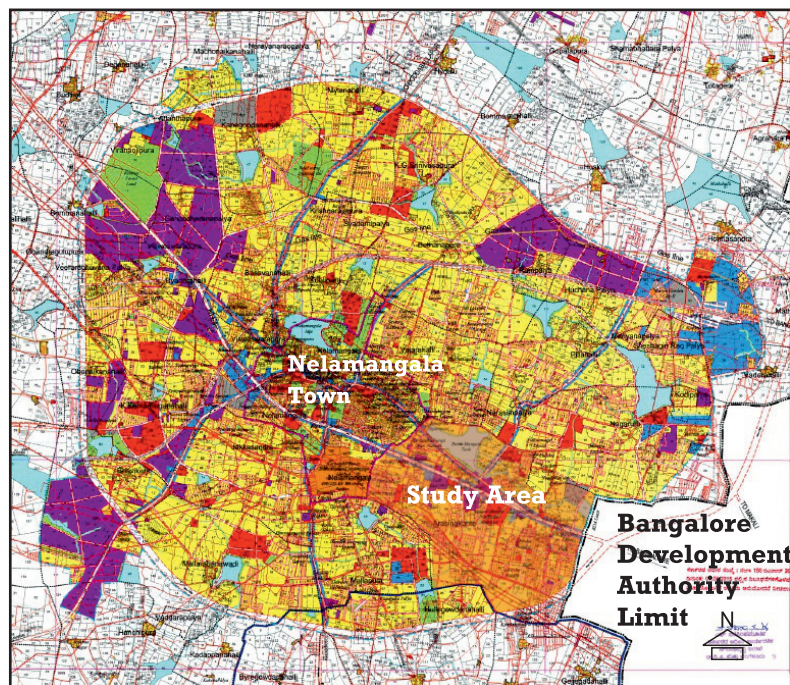
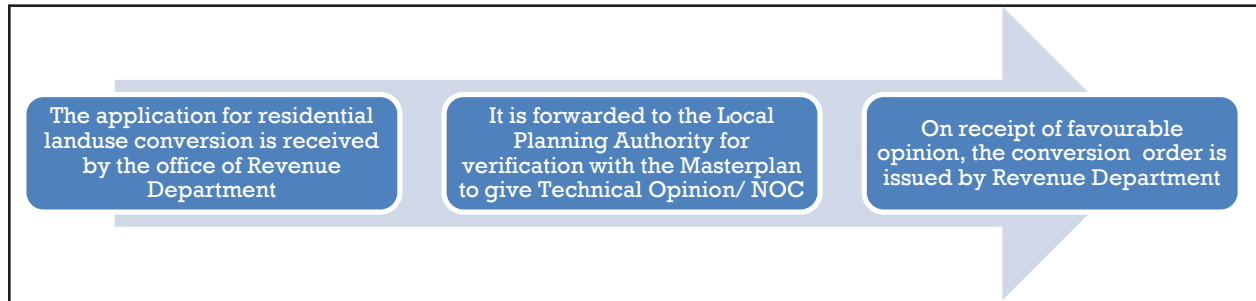


Fig. 3: Study area in the Master Plan 2031 of NPA for Nelamangala Conurbation





**Fig. 4: Institutional Procedure for Land Use Conversion from Agricultural to Non-Agricultural Land**



ment seeks a technical opinion from Nelamangala Planning Authority which is the local planning authority.

Hence for all conversions which is the first stage of the transformation process, the NPA maintains the data of technical opinion submitted to the Revenue Department. The secondary data of technical opinions given by Nelamangala planning authority for conversions within Arshinakunte limits in 2003-2019 period is considered for the study.

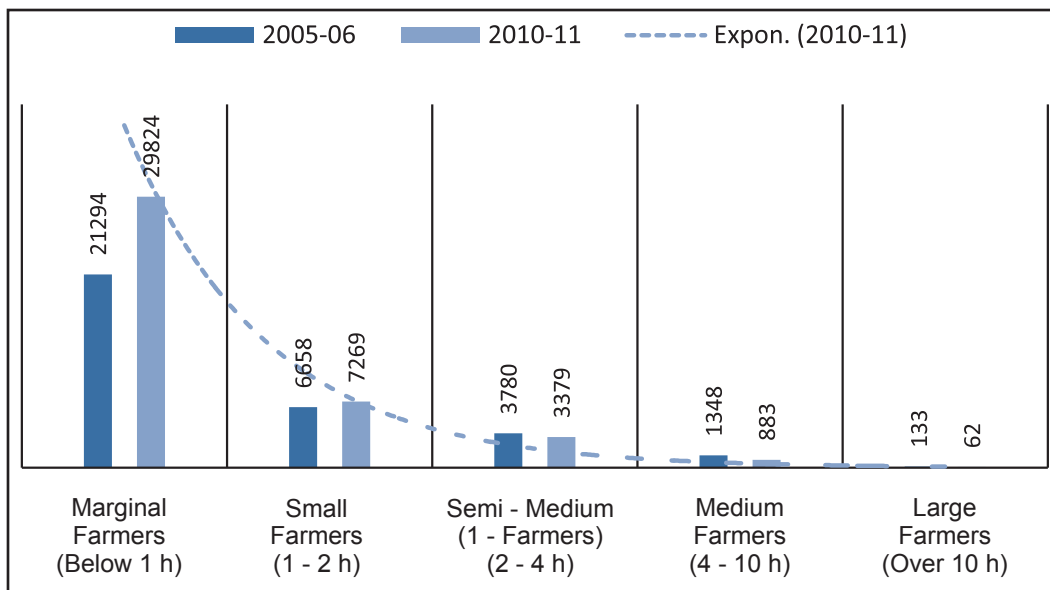
Also, the local planning authority approves the layout plans of new residential layouts. The data related to the layout approval granted by the planning authority forms another set of secondary data which assists in examining the transformation within the study area. The layouts approved between 2003-2018 are considered for the study.

#### 4.5 Nature of Agricultural Land Holding

The size of the agricultural land holdings predominantly determines the size of land which would go for conversion of land use. In India, the agricultural land holdings are small, and it is getting smaller with time due to division and subdivision of land inherited by families through generations. The national average of agricultural land holding size is 1.1 ha according to survey conducted by National Bank for Agriculture and Rural Development (NABARD) in 2015-16.

In Bangaluru rural district, for the year 2005-06, marginal holdings of less than one hectare and small holdings of extent one to two hectares account for 86.16% of the total agricultural land holdings. Only 0.44% land holders own land more than ten hectares.

In Nelamangala Taluk, where the study area is located, 84.15 % (NABARD) of the agricultural land holdings were of size less than 2 hectares in 2005-06. This percentage of small land holdings increased to 89.6% in 2010-11. Further this data also indicates that 72% of the agricultural land is less than a hectare. The

**Fig. 5: Agricultural Land Holding in Nelamangala Taluk- Number of Land Holders**


Note. Data as per Karnataka State Agricultural Census & Census 2011

average agricultural land holding size in Nelamangala Taluk reduced from 1.1 hectares in 2005-06 to 0.87 hectares in 2010-11 (Fig. 5). The size of the holdings is getting smaller through every decade. This prevailing condition justifies the average size of land which gets converted to urban uses.

## 5. VARIABLES

Land size is an important parameter based on which relevant Zoning Regulations are applicable for formation of layouts. The transformation is examined within the identified period (2003-2018) with respect to extent of land which goes through the land use conversion and layout formation processes. For this, the data regarding land use conversion from agricultural to residential land use is secured from the office of NPA through the technical opinions given. Since NPA is the layout approving authority, the data regarding approved layouts is also secured from NPA. The extent of land involved in the conversion process and the extent of land involved in the formation of layouts for each year through the identified study period are considered as variables for the study to assess the relation between the two processes.

## 6. METHODOLOGY

The size of plots involved in the two processes i.e., land use conversion and layout formation are analyzed to assess the relation between the two for the period during 2003-2018. The two data sets are tested by Mann-Whitney non-parametric test to compare the similarity between the two processes with respect to land parcel sizes.





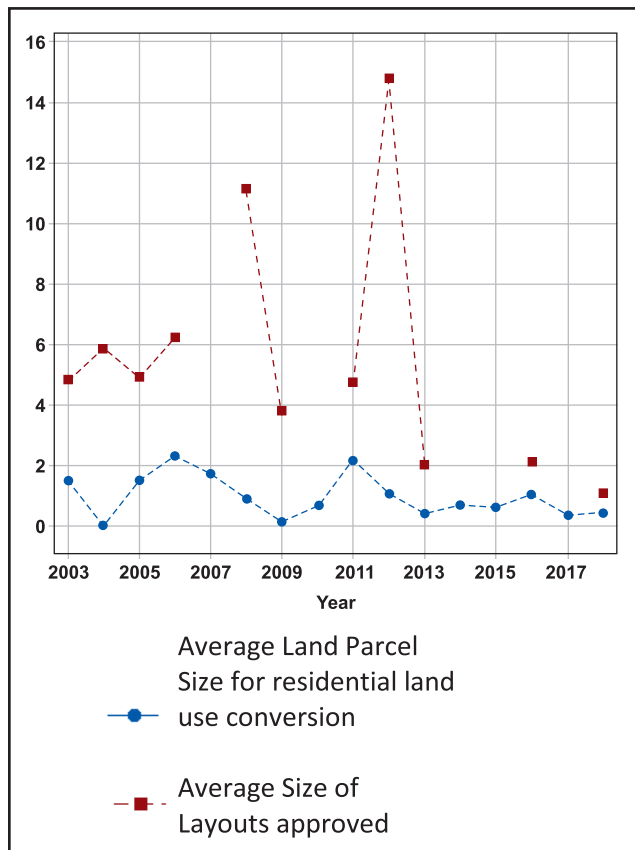
Time line comparison is made with respect to average land size involved in residential land use conversion and average size of the layouts for every year for the identified period.

The two processes are further analyzed by categorizing the size of land parcels involved. Five land size categories are identified and the number of land use conversions which have taken place for every category is recorded. This is compared with the number of layouts approved in the same size category. The bar graph depicts the comparison. The study recognizes the predominant land parcel sizes through which transformation takes place.

### 7. RESULTS

The time line plot indicates that there is disparity in average size of land for which conversion to residential land use takes place and with respect to the average size of layouts formed for every period of observation. Any land parcel converted into residential use does not translate into a residential layout of the same extent.

**Fig. 6: Time Series Plot- Average Land Size for Residential Land Use Conversion and Average Layout Size Approved**



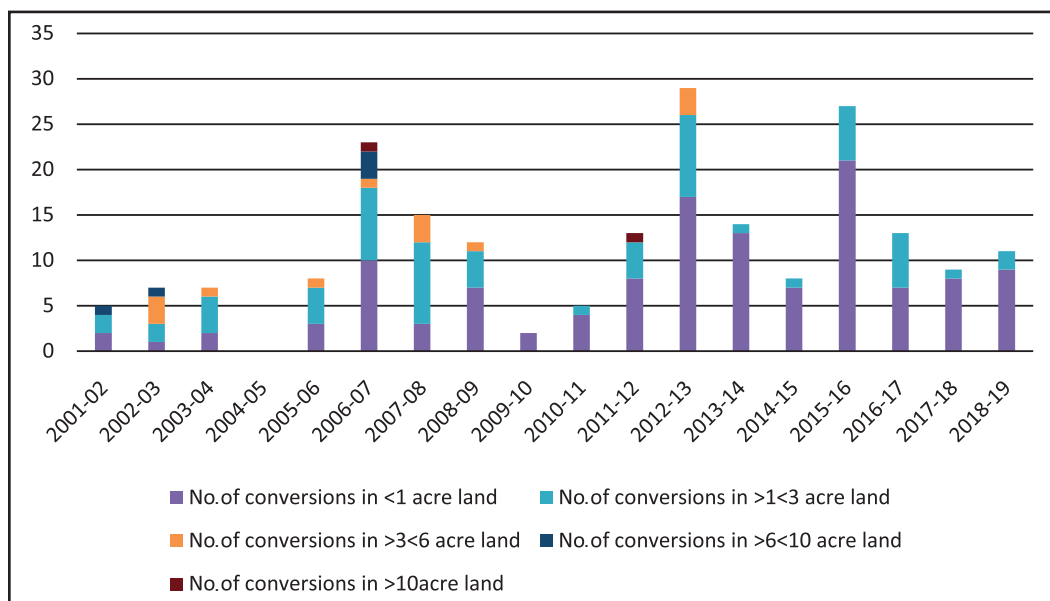
Further through the observation period, the average size of land which gets converted varies over a smaller range. This range is getting smaller with time. Whereas the sizes of layouts drastically change through observation period. It is observed that the sizes of layouts are getting smaller through the observation period also.

The results of Mann-Whitney U test indicate  $z = -5.730$ ,  $p < .05$  which justifies that there is a significant difference between the two data sets considered i.e., size of land which gets converted and size of layouts formed.

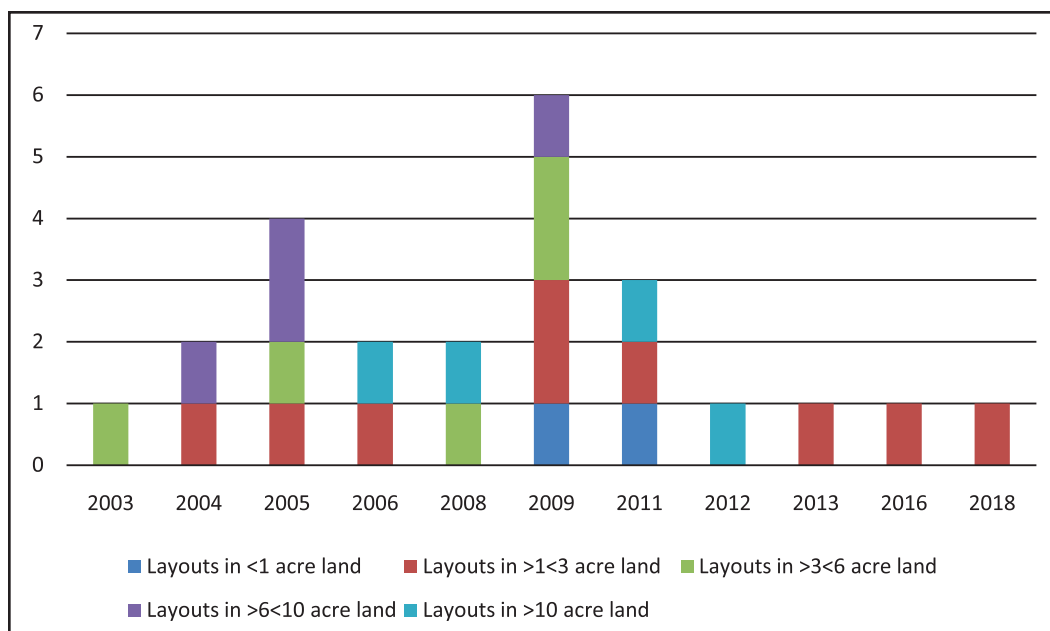
### 8. ANALYSIS AND DISCUSSION

The results of the study indicate that land parcels which go through the process of conversion do not directly translate as layouts of the same size. From the graph in Figure 6, it is evident that maximum number of conversions of agricultural land to residential land use takes place in land parcel size of less than one acre followed by the next category which is between 1 acre

**Fig. 7: Number of Conversions for Identified Categories of Land Size during the Observation Period**



**Fig. 8: Number of Layouts for Identified Categories of Land Size during the Observation Period**



to 3 acres. The graph in Figure 7 and 8 depicts that most layouts are approved in 1 to 3 acre Category, while there are some cases where larger layouts of 12-14 acres have been approved also. It is further observed that through time, the size of land which goes for conversion are getting smaller.



The data set of layout sizes indicated a larger variance showing that layouts of different sizes was an observed condition whereas land size which goes for conversion has a lesser variation indicating that fragmentation of agricultural lands through time has resulted in smaller land parcels. Hence conversion would take place with smaller land parcels, but the layout sizes may vary and generally larger than converted land sizes. The layout sizes are also predominantly in the range of 2 acres to 6 acres.

The smaller parcels which get converted are unable to translate as layouts due to constraint of size in accommodating and integrating necessary urban infrastructure. The important observation through the study is recognizing the presence of an intermediate process of consolidation of the converted land which takes place. This is evident by the disparity in the sizes of converted land and the sizes of layouts formed. The key aspect of the consolidation process is that it takes place in an informal environment and not as an institutional process.

### **8.1 Implication of an Informal Land Consolidation Process**

In the context of smaller parcels of converted land unable to provide serviced residential urban space, consolidation of land parcels becomes a necessity. The data collected from the Nelamangala Planning Authority with respect to individuals applying for layout approval reflect names of developers and individuals who bear address outside of the settlement and who in many situations are not the original landowners of Arishinakunte. This indicates the role of an intermediary to coordinate the process of consolidation to secure layout sanction from authority. This condition has a larger implication where the benefits of development do not reach the original landowners due to the involvement of intermediaries. Also, this mechanism has minimum stakeholder participation in the process of transformation and hence does not accomplish one of the fundamental objectives of urban expansion which is to incorporate an effective participatory mechanism.

The loss of agricultural activity is associated with loss of livelihood options which has strong economic implications for the local population. This along with inability to benefit from the transformation results in these communities subjected to stress which has larger social implications.

The informal nature of the consolidation process also results in delay in formation of residential layouts. The extended period of negotiations through the process of consolidation results in land being unproductive for long periods. The land neither serves agricultural use nor is it serviced for urban use. This condition results in speculative growth which is not realistic in terms of facilitating development on site. Leap frog development is also a consequence of these delayed transformations. This results in non-contiguous urban fabric which defeats principal objectives of achieving productive, sustainable urban expansion.

Engaging with the institutional procedures for conversion and layout formation may be too complex for owners of smaller parcels of land from technical and



economic perspective. This has also resulted in emergence of illegal layouts and hence unregulated growth which makes it a challenge to address the infrastructure needs of the settlement. This necessitates identification of relevant mechanism to be incorporated in the process of provision of serviced urban land to benefit the landowners and arriving at a holistic approach to new developments.

## **8.2 Provisions in the Zoning Regulation of NPA with Respect to Size of Layout**

The Zoning Regulation which is part of Master Plan, 2031 document of NPA has specified norms for approval of layout plans. All layout plans need to conform to the regulations in terms of minimum road width, the maximum extent of residential component in the layout, minimum extent of site in the layout. Also, the regulations specify a minimum of 10% of the total extent of the layout to be earmarked for parks and playgrounds and 5% of the extent of the layout for civic amenity area (Zoning Regulation Master Plan, 2031, NPA). Layouts which exceed 10 acres in extent should designate land for sewage treatment plant, transformer, overhead water tank.

In the context of increasing trend of smaller layouts being developed, Government of Karnataka issued a notification in 2006 regarding allocation of land for parks, playgrounds, and civic amenities. According to this notification, it was not mandatory for private layouts of extent less than 4000 sq m (0.4 hectare) to earmark land for open spaces and civic amenities. Instead, proportionate fees which was the market value of converted equivalent land was levied by the authorities apart from the fees payable for approval of layouts. This separate fee would form designated funds to be used for improvement of parks and open spaces.

This provision resulted in fragmenting layouts to size less than 4000 sq m to avoid allocation of land for parks, open spaces and civic amenities. Considering the implications of 2006 notification, another notification in 2012 restored the earlier rule of earmarking sites for parks, open spaces, and civic amenities for all layout sizes.

Thus, layout size has been having a strong implication in defining the fabric of the settlement.

## **9. IMPLICATION OF THE LAYOUT SIZE ON THE RESIDENTIAL FABRIC**

Considering the provisions in the Zoning Regulation document of NPA it is evident that the sizes of the layouts approved have an implication on the emerging residential fabric.

The size of land delineated for parks and civic amenities is deduced from the layout size. In the context of larger number of small to medium size layouts getting approved, the number of plots designated for these common public spaces will be more in number but of smaller size. These small plots for civic amenities may



face constraint in accommodating the relevant social infrastructure components of the residential fabric.

The spatial distribution of the plots for parks and civic amenities is also deduced from layout size. Layouts which are small, do not result in sizes of amenity sites which are relevant at the neighborhood or housing cluster level. Further very small sites for the amenities are a challenge to translate into effective public spaces. The dispersal of layouts of varying sizes would affect the dispersal of the open spaces and civic amenity sites. Thus, adequacy, accessibility to parks and amenities are determined by the size of layouts which emerge.

The delineation of sites for urban services such as waste water treatment plant, overhead water tanks need to be made in layouts which are of over 10 acre extent in accordance with the Zoning Regulations. When majority of layouts approved are of size smaller than 10 acres, definition of land for these important urban services are neglected. Further these components of infrastructure need to be provided in response to the natural systems in the context of the settlement. The layout size being the criterion for assigning land for these components of the settlement will result in inadequate, disorganized service provision.

Hence urban expansion through approval of layouts with large variation in layout size and in the absence of micro level planning by the authorities results in the new fabric emerging in piecemeal fashion. It would be a greater challenge to address the deficiencies after emergence of the fabric.

## 10. CONCLUSIONS

The urban influence on the periphery has resulted in transformation of the land use from predominantly agricultural to urban uses. The emerging settlement fabric in the peri-urban depends on the mechanism adopted to provide serviced urban land. In the context of peri-urban Bangaluru, provision of serviced residential land is predominantly through formation of private layouts conforming to the provisions of the Master Plan of the Local Planning Authority. Independent reorganization of land through formation of layouts in the absence of micro-level plan results in the new fabric emerging in a piecemeal fashion. Further when the land holdings are small, it becomes imperative to consolidate landholdings to systematically parcel land for urban uses.

The study identifies the process of consolidation of converted land parcels as an important intermediate step in the emergence of the residential fabric. The consolidation determines the possible size of layouts and hence the nature of the urban fabric. The consolidation method adopted also determines the involvement of the original landowners through the process of transformation and the possibility of the original landowners benefitting from development.

The allocation of land for social amenities, parks, open spaces depends on the size of layout and the Local Planning Authority need to view the implication



of approving mostly smaller layouts. Hence the level of provision is directly dependent on this nature of transformation. Securing land for public purpose after generation of the fabric, will come at a very high cost.

As way forward, micro level plan is crucial in defining and identifying land allocation. The mechanism of consolidation can partially or completely involve the local administrative institutions. The land use conversion, consolidation and layout formation can be a continuous process to overcome time delay in provision of serviced land and this can be guided by the institution. Incorporating stakeholder engagement through the process would result in inclusive growth. Hence considering the prevailing conditions of transformation, the mechanism adopted for developing serviced land needs to necessarily incorporate principles of inclusivity, productivity, and sustainability for urban expansion.

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# Assessing the Government Interventions for Slum Redevelopment: A Case Study of Cuttack

Shraddha Kar and Aman Singh Rajput

## Abstract

*Developing economies like India have a higher concentration of poor people living in cities which is visible in its growing slums and informal settlements over the years. The central and state governments have taken several initiatives to solve this problem such as poverty alleviation, slum up-gradation and redevelopment programs and policies. However, dwellings units constructed under these schemes are still lying vacant due to unwillingness of slum dwellers to shift. This is majorly due to the quality of the housing units constructed and the lack of basic social and physical infrastructure available. The research involves the study of slums interventions schemes - VAMBAY, RAY, IHSDP and PMAY in the commercial capital of Orissa the city of Cuttack. The paper examines the issues, problems and potentials with the government interventions and recommends the city level preventive and improvement interventions strategy.*

## 1. INTRODUCTION

Government interventions for housing following independence have their changing roles from the direct provider in the beginning to enabler in the 1970s to mobiliser by 1980s. First National Housing policy was launched in 1988, encouraging the private sector participation. Post economic liberalization in 1994 the government acted as a facilitator providing the legislative and financial framework for private participation. Following this Valmiki Ambedkar Awas Yojana VAMBAY in 2001 was introduced to provide housing for BPL households. Further, in 2005 Jawaharlal Nehru National Urban Renewal Mission (JnNURM) was launched addressing the housing interventions using targets for low-income households under IHSDP (Integrated Housing and Slum Development Program). The Rajiv Awas Yojana (RAY) under JnNURM was introduced in 2013 by Ministry of Housing and Urban Poverty Alleviation which aimed to provide the amenities and infrastructure to slums, slum rehabilitation and creation of affordable housing mechanisms. The most recent mission launched is Housing for All to provide housing to the entire urban population by 2022. Apart from these central government policies, the land being a state subject state government also frame policies for housing and implement them using parastatals.

Despite these efforts made by the government, population residing in slums increased by 30.8%, from 2001 - 2011. The number of slums households rose

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from 10.2 million to 13.8 million contributing nearly 17% of the entire urban households. Another noticeable trend in the same period is the increase in the vacant houses from 6.5 million to 11.1 million, which constitute nearly 12% of the total urban housing stock. The housing units built under centrally sponsored scheme JnNURM, RAY and PMAY(U) had a vacancy rate of 17% in 2017 as they were typically located at a distance from city centres. The reasons cited for the vacancy are unwillingness of the slum dwellers to move in relocation projects and lack of basic infrastructure (MoHUPA, 2016). The Sustainable Development Goals - 11 is related to slums in urban areas and states to ensure access to safe and affordable housing and basic services for all by 2030 (UN, 2016).

Based on this backdrop the research paper tries to evaluate the housing units developed under slums improvement programs in the commercial capital of Orissa the city of Cuttack. The study involves research on the growth and socio-economic characteristics of slums in the city. Further various interventions made by the government for slum improvement are evaluated to study the effectiveness and the causes of their success and failure. The research recommends a city level preventive and settlement level improvement intervention strategy. The research would help the planners and policy makers for optimum utilization of the resources available to achieve the government provision for adequate housing for the urban poor.

## 2. METHODOLOGY

This section describes the conceptual framework of methodology for the research. The research involved the study of Cuttack city in the context of slum development to understand slum profiling from the literature review of secondary sources. The profile includes the study of types of slums and their characteristics and socio-economic conditions. Further slum improvements programs of the central and state along with the role of organizations in the implementation of the programs. Criteria for selecting the housing projects across the city scape can be divided into two levels: policy and settlement. Under policy levels, the projects built under various policies of the central and state had been considered. Within these, the final projects were selected based on the location, population and area, number of dwelling units and the role of community organizers and NGOs.

The selected settlements were analyzed using the techniques, mapping, observation, focus group discussions, photo documentation and visual survey for assessing the performance of each housing projects. This step involved analysis of settlement pattern along with their demographic and social profiling. The most important information gathered during surveys is the type of housing in the slums. The survey also included information like land ownership pattern, physical infrastructure adequacy. Furthermore, social infrastructure mapping





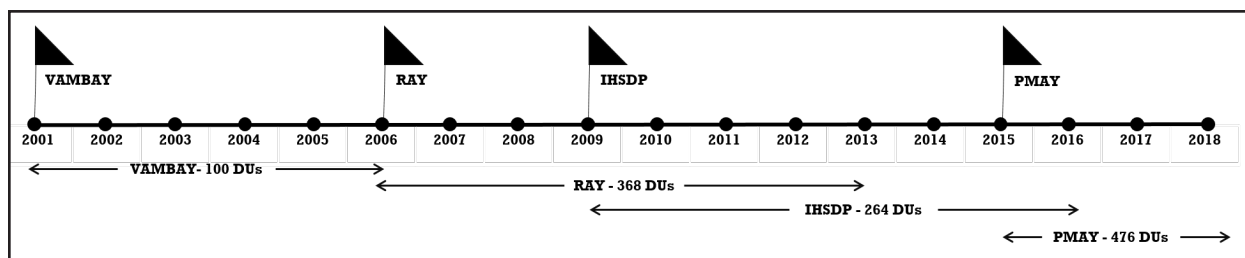
was also carried out to understand their accessibility. Based on the assessment each settlement was scored on five variables with twenty indicators.

### 3. CUTTACK - SLUM PROFILE AND GOVERNMENT INTERVENTIONS

Cuttack is a Tier-II city - nerve centre for trade and commerce located in the eastern coastal plains of India. The city is well connected through road network NH - 16 connecting the city to Howrah and Chennai and NH - 55 connecting to Nagpur. The city lies on the east coast railways connecting it to major areas - Howrah, Chennai, Paradip and Talcher. In 1876 Cuttack municipality was formed. Following independence, in 1949 the capital shifted to Bhubaneswar. In 1951 with the establishments of large scale industries Chowdwar was formed. The major reasons for the growth of slums in the city are the increase in the employment opportunities, destruction by the super cyclone in Odisha and feminine. The slum improvement approaches in the city were taken in three components - slum re-location, slum re-construction and slum networking. The Cuttack Development Planning Area (CDPA) has Cuttack municipal corporation (CMC), Chowdwar municipality (CM) and 60 villages. CDPA is known as the urban commercial complex which has led the region as an economic exchange zone. As per the census of India, 2011 CMC has an area of 192.5 sq km with a population of 6, 10, 189 out of which 38% is slum population living in 249 slums. The slums in Odisha are defined as per the Odisha Land Rights to Slum Dweller. There are in total 300 slums in CMC out of which 264 are identified. The identified slum is defined as a compact area of at least 60 - 70 house holds or 300 population of poorly built congested tenements, in an unhygienic environment with insufficient infrastructure and deficient in proper sanitary and drinking facilities.

Out of the 264 slums identified within the CMC 181 are authorized supporting 98,841 people and 83 are unauthorized accommodating 30,689 people. Nearly 57% of these slums are located on state government land. The land tenure in Cuttack is in the form of *patta* and *co-pattadar* system. 68% of the total slums have *patta* tenure and 32% have insecure land tenure. Various central and state government slum interventions undertaken by the state and central government and implemented by CMC in the city are analyzed. Out of the total proposed dwelling units from various schemes, only 35% of dwelling units have been proposed to date. Land litigation is a major issue leading to failure of redevelopment and relocation projects. The acceptability of the relocation project is good as the city is small in areal extent and the connectivity is good. Study of various slum interventions schemes in the city of Cuttack along with their time line was done to finalise the schemes for the research (Figure - 1), which are - Department for International Development Program (DFID), Valmiki Ambedkar Awas Yojana (VAMBAY), Integrated Housing and Slum Development Program (IHSDP), Rajiv Awas Yojana (RAY) and Pradhan Mantri Awas Yojana Urban (PMAY (U)).

Fig. 1: Time line of Housing Interventions in Cuttack



Source: Author

Table 1: Sites Selected for the Research

S. No.	Slum name	Type of intervention	Year	Ward	Location	Area (acre)	Population	DU
1	Pilgrim road	DFID	1998	38	Core	2	1466	393
2	Jhangirmangala Lunia Sahi and Pana Sahi	VAMBAY	2001	29	Core	2.17	223	66
3	Munda Sahi Rehabilitation	RAY	2006	3	Fringe	2.49	578	150
4	Tulsiapur Tanla Sahi Slum	IHSDP	2009	8	Fringe	1.8	1320	264
5	Laxmanpur Harijan Sahi	PMAY	2016	48	Fringe	5.18	225	73

Source: Author

#### 4. CASE STUDY PROFILE

##### 4.1 Pilgrim Road

In the year 1998, the intervention of DFID program was undergone to promote sustainable development and eliminate the poverty under which 4 slums were identified. The Pilgrim Road (Table 1) is selected for the case study due to the maximum implementation of the programme and higher density. The slum is located at the central core part of the city. It is an unauthorized slum developed on government land. A settlement pattern is a linear form due to canal. It is surrounded by residential locality and street vendors along the road. The settlement is 1.5 km away from NH-16. The slope of the settlement is towards the canal. The houses are structurally not sound and tilted towards the canal because of the soil and topographical condition. The rear part of the house opens up towards the canal. The contaminated stagnant water leads to mosquito breeding and other hazardous diseases. The profile of slum dwellers is that they are majorly rickshaw pollers, daily labourers and petty traders. Their livelihood is dependent on such jobs because of a lack of literacy and less formal job opportunities.

With the current scenario of the DFID intervention, there has been a lot of loopholes in the development and maintenance. As the NGOs raised their hands



the maintenance and the development was not taken care of, which lead to dilapidation and bad housing condition. Similarly, with an increase in population and dwelling unit density, there was the stress of the social and physical infrastructure which was one of the major concerns.

#### 4.2 Lunia Sahi Jhangirmangala

There were slum pockets which were called “Sahi” in Odisha. In 2001, VAMBAY was launched in Orissa for up-gradation of houses those who came in the BPL category with SC/ST/OBC category. The main reason for selection of this slum for VAMBAY case study is because this slum pockets consist of a major group of slums which has 7 different slum pockets which were segregated as per caste. Before this, the slum dwellers were majorly involved with political ruling parties for the up-gradation of city facilities and slum settlement benefits.

This is a slum pocket which was more than 50 years old surrounded by ancient houses and aligning to the core city nearby the Link Road and Badambadi Bus stands which is the main hub for the goods and transport system. The roads in the settlement are very narrow due to open drains on both the sides of the road. The settlement dominates SC category. There are many small commercial shops which are used by the slum dwellers for their daily needs. There are many small and medium scale factories in the settlement which gives job opportunities to the slum dwellers.

#### 4.3 Tulsipur Tanla Sahi-IHSDP

The IHSDP was launched in 2009, by Government of Odisha to provide free housing to evicted slum dwellers. The beneficiary were those who were living in the area and having their name in the voter before 2001 list and are having the electoral card before 2001. The other identification proof taken in this regard is the BPL card issued before 2001 and ration card issued before 2001.

In the year 2010, CMC declared to provide housing to Tulsipur Tanla Sahi and Andarpur with an estimated cost of Rs.16.58 crore including all infrastructures for the project. But due to delay the cost was escalated to Rs.27.5 crore with few infrastructures. In 2014, the then Odisha Police Housing Corporation took the project and constructed 264 transit homes for Tulsipur Tanla Sahi slum dwellers. Due to the lengthy process of the civic body in clearing the bills of contractors and low price of the project no private agency were taking up the project which leads to delay for 2 years.

The settlement lies near the bank of the Mahanadi River adjacent to the police colony. The ring road is the main road which makes the connectivity to the city easy for the slum dwellers. The slum dwellers were squatting in the particular land which has been converted to in-situ redevelopment project giving land right certificate so that slum dwellers cannot leave the house and put it on rent. This



site lies on the eastern side of Cuttack Municipal Corporation area. The plot is located near a posh locality but is adjacent to the canal.

The program focussed on in-situ rehabilitation which highlighted the rehabilitation process for unauthorized slums. The slum dwellers were evacuated from their squatter settlement on some condition. However, they were not provided with their houses due to management's negligence. This is a particular case which laid a trust issue between the slum dwellers and the government.

#### 4.4 Balimiki Nagar Munda Sahi Rehabilitation

Munda means tribal community in the tribal language. These are the people who moved to Cuttack city after the super cyclone. These people moved to Sector-6 of CDA area which was already in the fringe area of Cuttack city. They squatted in a government land which was owned by Cuttack Development Authority. Many interventions were carried out in this particular slum because of the huge number of households and residents and while rehabilitation around 1200 slum dwellers was rehabilitated in which 250 plots were provided to the slum dwellers at a single eviction. The government in a single eviction has provided the maximum number of land rights to date.

In 1999, after super cyclone, Munda Sahi moved to Sector - 6 and squatted in a government land owned by Cuttack Development Authority. In 2000, the Cuttack Development Authority started development however, on Sector - 6 squatted area there was a proposal for constructing hospital which was a public purpose therefore, eviction of slum dwellers became necessary. Out of 1200, only 600 people were rehabilitated to Munda Sahi. In 2007, 600 people constructed *Kutcha* houses initially. The settlement is adjacent to National Law University and CDA residential area. The settlement is connected to the city centre by Naraj ring road and Shelter road. The settlement is 10 km from Cuttack railway station and 8 km from ISBT. The entrance to the settlement is via *kutcha* road which is 0.75 km from the main Naraj Cuttack ring road. Open areas are usually utilized as children play area and community gathering space.

The settlement was maintained through the private NGO's help, counselling and guidance with the slum dwellers. As per RAY report, it is mentioned that, 1965 population is to be catered to. But under RAY only 112 houses are provided. Houses made under UDRC and Lions Club, lacks natural ventilation and daylight. Settlements are well cleaned and maintained by community people.

#### 4.5 Laxmanpur Harizan Sahi

With the increase in industries, Nimapur zone was developed. The slum Laxmanpur is 10- 20 years old slum. These people got patta under which they were able to construct a house under PMAY. This is the zone where the maximum amount of PMAY houses are built and beneficiaries have applied. Laxmanpur is one of the



slums in that zone. This slum is called a driver's colony because people here are involved in driving as their daily source of income. As the slum is situated near to the canal so majorly it gets affected in the rainy season. Laxmanpur is located in the northern part of the Cuttack city near Jagatpur industrial town. The major industrial corridor has surrounded the settlement. The settlement is also nearby to the Choudwar Municipality which was also an industrial town for some time. The settlement is situated in a fringe area with lack of communicability.

There was sub-division of lands, which were further transferred in the name of daughters and other family members. Hence, these practices lead to the construction of more number of dwelling units without any incorporation of bye-laws. However, these were multi-storeyed building as PMAY BLC model was followed. The model was developing in a haphazard manner which leads to many consequences.

## 5. RESULTS AND DISCUSSIONS

### 5.1 Quantitative Evaluation

As per the quantitative evaluation (Table 2), the amount proposed, and the achievements within the time frame provided under rehabilitation project IHSDP is being successful in providing more number of dwelling units and in case of in-situ up-gradation program RAY has been successful in providing houses to the slum dwellers in the city. PMAY is under progress which has huge potential to supply a large amount of houses under the BLC model in near future.

**Table 2: Comparative Analysis of Slum Settlements**

	DFID	VAMBAY	RAY	IHSDP	PMAY
Year	1998-2005	2001	2009	2010	2016
Eligibility Criteria	Status and condition of slum dwellers out of 156 slums	BPL -SC,ST,OBC	Kutcha roof, With Patta/ Joint Patta	Evicted slum dwellers	Patta holders Income certificate
Case studies	Pilgrim Road	Jhangirmangala Lunia Sahi	Balmiki Nagar Munda Sahi	Tulsipur Tanla Sahi	Laxmanpur Harizan Sahi
General profile					
Land	PWD department	Own patta	Own patta	CDA land	Own patta
Population	1466	223	578	1320	225
Area (acre)	2	2.17	2.49	1.8	5.18
Pop Density (Ppa)	733	102	232	733	43
Total no. of DUs	393	66	150	264	73



		DFID	VAMBAY	RAY	IHSDP	PMAY
Year		1998-2005	2001	2009	2010	2016
DU. density (Du/acre)		196	30	60	146	14
Settlement level						
Average HH size		6	7	5.5	-	5
Occupation		Daily Labourers, Rickshaw pullers, Hawkers	Daily Laborers, Rickshaw pullers, Sweepers and maids	Informal Business, Rickshaw puller, Maid & Private Services	Fisherman, Auto drivers, Laborers, Sweepers	Drivers, Maids, government employee
Monthly Income	<5000	30%	40%	25%	20%	10%
	5000-10000	50%	35%	37%	60%	40%
	10000-15000	10%	15%	31%	8%	24%
	>15000	10%	10%	7%	12%	26%
Structure type	Pucca	40%	40%	78%	Most of them were pukka houses.	40%
	Semi-pucca	12%	20%	13%		48%
	Kutchha	48%	40%	9%		12%
Dwelling unit level						
Height		100% GC with single storied	100% GC with single and double storied.	Single storied	G+4 1bhk flats	Single and double storied
Cost of Dwelling Unit		-	Rs.20,000	Rs.25,950	Rs.5,70,000	Rs.4,00,000
Loan if any		-	Repayment Arrear	Repayment Arrear		Swarnashree
No. of schemes implemented		Cuttack Urban Service improvement Project	RAY, VAMBAY, Swach Bharat	Majorly RAY and Swach Bharat programme	IHSDP	PMAY AND Swach Bharat programme
Physical infrastructure						
Water		Community Tap and individual pipe water connection by CMC.	Community Tap and individual pipe water connection by CMC.	Municipal Corporation community tap, Boring system and 3 Tube wells	Individual pipe water connection by CMC.	Community Tap and individual pipe water connection by CMC.
Electricity		CESCO	CESCO	CESCO	CESCO	CESCO



		DFID	VAMBAY	RAY	IHSDP	PMAY
Year		1998-2005	2001	2009	2010	2016
Roads	Pucca	60	75	100	100	50
	Kutchha	40	25	-	-	50
Drainage		Mostly open drain along the street.	Mostly open drain along the street.	Closed drain	Closed drain	Open and closed drain
Sewerage		Sewer trunk line to the settlement.	Sewer trunk line to the settlement.	Septic tank	STP	Sewer Trunkline to the settlement.
Garbage Disposal		In the canal next to the settlement	Collected by CMC	A resident of settlement manage.	Collected by CMC	Collected by CMC
Community Toilets		3 - bad conditions due to which people prefer OD.	-	3	-	2 Community toilets - constructed by Tata Trust
Providers of Infrastructures		CMC, CUSIP, TATA TRUST	CMC	CMC & UDRC	CMC	CMC & TATA TRUST
Social infrastructure						
Hospital		As Cuttack is the medical hub of Odisha, so mostly slum dwellers got SCB medical treatment which cost is as per their affordability.				
Aanganwadi		Within the settlement except for Tulsipur Tanla Sahi under IHSDP				
Commercial Center		Private shops	-	Private shops	-	Choudwar market.
Open space		No open space	No open space	2%	15%	No open space

Source: Authors based upon the field survey

## 5.2 Comparative Analysis of the Slum Settlements

Following inferences are drawn from the comparative analysis of various interventions (Table 2) with specific reference to the city of Cuttack:

- Slum-dwellers are, majorly, labourers; they can use their skill for up-gradation of houses, if funds are provided as per their needs and proper monitoring is done;
- The slum dwellers find no difficulties in getting relocated from one place to another, however, the matter of concern for them is a house secured from eviction to stay;
- Many slum dwellers have regularly evicted due to lack of tenure which becomes very difficult for them to move;

- The responsibility of CDA is to provide adequate housing to people of different income group, but the ground scenario is much different;
- Presence of program of leasehold tenure to the individual urban poor in the Odisha State;

**Table 3: Qualitative Evaluation of Various Slum Interventions**

S. No		DFID	VAMBAY	IHSDP	RAY	PMAY	TOTAL
<b>Housing</b>							
1	Size of house	2.5	7.5	4.5	7.5	10	32
2	Design flexibility	4.5	2.5	2.5	2.5	10	22
3	Quality of construction	7.5	10	7.5	2.5	10	37.5
4	Light & ventilation	4.5	4.5	7.5	2.5	7.5	26.5
<b>Total</b>		19	24.5	22	15	37.5	118
<b>Amenities</b>							
5	Accessibility	10	10	7.5	10	4.5	42
6	Completion status	10	10	4.5	4.5	10	39
7	Condition of house	2.5	4.5	10	2.5	10	29.5
8	Open spaces availability	2.5	2.5	10	7.5	2.5	25
<b>Total</b>		25	27	32	24.5	27	135.5
<b>Physical Infrastructure</b>							
9	Water Supply	10	10	10	4.5	4.5	39
10	Electricity	10	10	10	7.5	7.5	45
11	Solid waste management	2.5	2.5	7.5	2.5	7.5	22.5
12	Drainage	2.5	2.5	7.5	4.5	4.5	21.5
<b>Total</b>		25	25	35	19	24	128
<b>Social Infrastructure</b>							
13	Community hall	2.5	2.5	4.5	10	4.5	24
14	Aanganwadi	4.5	4.5	2.5	7.5	7.5	26.5
15	Health Center	2.5	2.5	2.5	2.5	2.5	12.5
16	Schools	4.5	4.5	2.5	2.5	4.5	18.5
<b>Total</b>		14	14	12	22.5	19	81.5
<b>Others</b>							
17	Flow of funds	10	10	7.5	2.5	4.5	34.5
18	Beneficiary contribution	2.5	4.5	7.5	10	2.5	27
19	More than 1 scheme	7.5	2.5	10	2.5	2.5	25
20	Parking Space	2.5	2.5	10	4.5	4.5	24
<b>Total</b>		22.5	19.5	35	19.5	14	110.5
<b>Overall Total</b>		105.5	110	136	100.5	121.5	

Source: Author





- Presence of all different wings of Slum Improvement Authority under CMC gives better performance and coordinated work, but, at the same time, coordination with other departments such as the public health department, social security schemes and skill training department needs to be on the same platform;
- The private partnership is not seen in any of the redevelopment projects in the slum areas of Cuttack due to the time delay by the government officials;
- Delay in the project leads to cost escalation and transforming transit homes into a new slums. Accordingly during the implementation of a scheme future expansion of the household need to be considered;
- CDA has objectives of demand assessment and does supply housing stock through allotment department;
- In PMAY scheme there is a huge informal money transaction by the beneficiaries through loans. 30% of interest is to be paid because of which they compromise in their basic need such as health, sanitation, etc., and
- Under RAY, the under constructed houses are increasing the vacant stock.

### 5.3 Qualitative Evaluation

Qualitative evaluation is carried out to understand the qualitative effectiveness of certain parameters of the schemes (Table 3). The parameters are based on the assumption of various qualities and other parameters required for grading. The overall analysis is based on primary survey observations. The qualitative analysis mainly focused on the type of living condition, their socio-economic condition which directly or indirectly affected the habitation. The social and physical infrastructure are two major components for habitation which are present but neglected due to lack of awareness, comfort and social inequalities. Hence, to grade the effectiveness of housing, the quality provided in each scheme is compared.

With this qualitative evaluation procedure, the final result infers that majorly under the parameters of housing and amenities the quality provided in every scheme is better. Infrastructure and finance are a few components which are neglected due to which the quality of intervention is degrading.

## 6. CONCLUSIONS

The outcome of the study is derived from the quantitative and qualitative evaluation. Each scheme has some positive effect and few negative effects but the quality is derived taking all aspects. If there is any strategy to rehabilitate or relocate the slum dwellers with a large population then IHSDP model can be referred. In the case of up-gradation PMAY-BLC model can be considered. In the cities, beneficiary-lead construction is quite successful because the majority



of the population in slums are involved in construction works as labourers, masons, etc. They built their houses as per their requirement. Some of the city level recommendations are adopting preventive measures for controlling the growth of slums in the city and curative measures for improving the current slum condition. There is a need for the formulation of the portal for proper documentation of land records, land titles and landowners' details, in a single platform, and updating it from time to time to make things clear and transparent. The state government should have defined standards for physical as well as social infrastructure. An approach of combining the certain number of slums, in a single pocket, for allocating social infrastructure as per location and radius from the pocket can be adopted. Creation of employment generation activities and skills training should be an integral part of the overall slum development process and women should also be involved in domestic economic activities and the creation of formalized saving account. Policy level interventions for successful implementation of various programs and schemes are awareness generation through various camps at different levels (ward and community) and pro-active campaigning. The policy should involve Integrated habitat development approach not only upgrading houses and regular check on the dwelling unit structure and foundation to be mandated to keep the units disaster resistance. Proper demand surveys to be done before any scheme gets implemented to prevent overlapping of schemes. The settlement should be evaluated under qualitative tools and then most vulnerable beneficiaries can be selected for intervention.

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# Challenges of Transit Oriented Development (TOD) in Indian Cities

**D. Siddi Ramulu, K. Sankar and Aman Randhawa**

## Abstract

*Transit Oriented Development (TOD) is an urban development paradigm that seeks to promote sustainability, livability and equity. Considering its relevance for sustainable urban development, promotion of mass transit systems and generating the much needed non-fare box revenues through value capture mechanisms, TOD is advocated in National Urban Transport Policy (2014), National TOD Policy (2017) and Metro Policy (2017). In the Indian context, TOD is going to play critical role and will shape the future of urban development. However, the progress on TOD projects, so far, has been slow due to manifold challenges. These challenges are multi-dimensional such as legacy urban development issues, policy and regulations, involvement of multiple agencies for planning and development of urban infrastructure, institutional weakness, land acquisition issues, deficient financing and lack of strong political will and commitment. This paper discusses various challenges of TOD in Indian cities and suggests the solutions and way forward.*

## 1. INTRODUCTION

Transit Oriented Development (TOD) is defined as development of concentrated moderate-to-high density mixed land use comprising housing, employment, shopping and recreation nodes integrated with pedestrian, bicycling, feeder and transit networks within 5 to 10 minutes of walking distance from mass transit stations (BMRCCL, 2018). TOD is an evolving urban development paradigm which seeks to promote sustainability, livability and equity. The various components of TOD are (i) mixed and transit supportive land use, (ii) medium to high density nodes, (iii) complete urban streets, (iv) attractive and safe NMT infrastructure, (v) accessibility to public transport, (vi) public spaces, preservation of environment, landscape and cultural heritage, and (vii) travel demand management (MoUD, 2016).

TOD is advocated in National Urban Transport Policy (2014), National TOD Policy (2017) and Metro Policy (2017) considering its pivotal role in sustainable urban development, promotion of mass transit system and generating the much needed revenues through value capture mechanism. TOD is going to play critical role in shaping the future urban development in India. However, the progress on

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TOD projects so far has been slow in India due to manifold challenges. These challenges are multi-dimensional i.e. legacy urban development issues, policy and regulations, involvement of multiple agencies for planning and development of urban infrastructure, governance and institutional capacity, land acquisition issues, deficient financing and finally lack of strong political will and commitment to take the projects forward. This paper discusses the various challenges faced in Indian cities in planning and implementation of TOD projects.

## 2. CHALLENGES OF TOD IN INDIAN CITIES

TOD is a complex urban development project involving multiple agencies and stakeholders requiring massive investments. The projects involved in TOD are diverse from simple traffic management to a complex design and implementation of urban street network, landscaping, NMT facilities, feeder services and cost intensive projects such as multi-modal integration facilities and multi-modal hubs and implementation of mixed land use projects especially affordable housing. TOD requires a strong foundation of policy framework, land use regulations to encourage compact and mixed development, institutional and financial capacity and involvement of stakeholders including the residents in the TOD zone. The shelf life of TOD projects also varies from short term to long term.

The reluctance on the part of state governments / local bodies / urban development authorities in formulation of TOD policy and incorporation of TOD guidelines as part of Development Control Regulations in Master Plan, absence of functional and empowered coordination agency, poor conceptualization of projects, lack of detailed studies, lack of consensus among stakeholders and paucity of funds have resulted in slow progress in realizing the TOD projects. Even though, TOD policy is pre-requisite for seeking central government funds for the implementation of Metro Rail Projects, many state governments do not have TOD policies in place as mandated by the MoHUA but have only formulated TOD principles. Based on the authors experience in working various cities in India, there is a view and apprehensions of stakeholders that TOD is being implemented as a commercial development project rather than a holistic sustainable urban development model due to excess focus on value capture mechanisms such as use of higher FAR and ignoring other components of TOD.

Given the range, complexity and investments required, the TOD projects entail detailed planning, stakeholder consultations and comprehensive design. More often, one or two components of TOD are implemented rather than conceiving the project holistically. Planning and stakeholders consultations are not given due importance and there is a haste to get into implementation.

The challenges of TOD in Indian cities are discussed under the following sections i.e. (i) urban development challenges, (ii) master plans, (iii) Development control regulations, (iv) institutional issues, and (v) financing.



## 2.1 Urban Development Challenges

Significant urban expansion in Indian cities has happened in organic way and it has not been the result of planned development. This has caused the skewed land use, urban sprawl, absence of hierarchical street network, in-adequate ROW for road development, proliferation of slums in public lands i.e. along the railway lines, lakes, *nallas* etc., (Singh, 2009). It is common in Indian context that deviation from the actual development as compared to the sanctioned Master Plan due to the violations in land use and development control regulations like floor area ratio (FAR), setbacks, ground coverage and encroachments. High cost of land, conservative regulations (which ignore the demand for space), lack of effective monitoring and weak enforcement are some of the reasons for wide spread violations which has not only resulted in unplanned development against the spirit of Master Plans but also has caused huge revenue losses to the local bodies / development authorities over the years (Nallathiga, 2016).

The planning and provision of transport infrastructure (like street development, passenger terminals and multi-modal facilities), other basic infrastructure (water supply, sewerage, storm water drainage, solid waste management and electricity) and social infrastructure (hospitals, schools, play grounds, parks, recreational and cultural facilities) have not kept pace with growth in population / employment primarily due to lack of proactive planning and funding. It can also be noticed that significant part of the new Master Plan efforts normally focused on absorbing the unplanned growth especially fast growing cities.

Further, there are multiple authorities / agencies involved in urban infrastructure development. Lack of coordinated planning and implementation has been resulting in piecemeal and fragmented development.

Once an area is developed without a sustainable planning approach, retrofitting the infrastructure is a tedious task involving high costs due to land acquisition, resettlement and rehabilitation and complexity in implementation in built-up areas. However, above costs are less as compared to replicating similar infrastructure at periphery of the city. (UN-HABITAT, 2017)

TOD envisages land development and augmentation of the transport and other infrastructure along the transit corridors. However, the provision of municipal services such as water supply and sewerage cannot be planned in isolation exclusively for the limited TOD corridor but has to be planned and implemented at the city level. The same is applicable to road network which needs to be planned and designed to improve access to the public transport beyond the standard TOD influence area of 500 m strip.

Displacement of low to medium income residents from arterial corridors due to sharp increase in land and property prices known as gentrification has been



happening in Indian cities as well. These residents are predominately public transport users and will significantly affect the public transport ridership and thus its viability. The impact of gentrification has been identified in major cities like Mumbai, Delhi, Ahmedabad, Pune, etc., where slums were relocated for uses related to commercial malls, residential housing units, recreational zones, etc. (Vidhate & Sharma, 2017).

Mass transit corridors such as Metro Rail systems are typically planned along the major arterial roads with well-developed commercial and institutional areas especially within the city limits and therefore, largely command high land prices. This facilitates densification which further results in higher land prices. (Setia & Swamy, 2014).

Value capture mechanism has been based on the premise that government will benefit by capturing the part of the value created due to the development of transit system and assuming that difference in cost of land and properties before and after announcing the development will be huge. However, in reality it is not the case in most of the developed areas as land prices are already high. Further, non-availability of government lands along the high arterial roads makes value capture very difficult as acquisition of private lands for TOD is unviable. Thus, high land prices on well-developed major arterial roads limits the value capture benefits.

Redevelopment of older areas allows efficient use of precious land and releases land required for development of urban infrastructure and thus improves the quality of life. In core areas and along the major arterial roads, there is acute shortage of land for public purpose like for development of roads, housing, open spaces, etc. Unless, land pooling and redevelopment happens, land is not going to be available for public purpose (Egolum & Emoh, 2017). Generally, the ownership of land along the arterial corridors is mainly private. People in general have emotional attachment to land parcel, lack of many successful land pooling examples, trust deficit in the process and apprehensions of people on outcomes post redevelopment pose hindrance to land pooling for redevelopment. Redevelopment requires detailed planning, defining appropriate legal framework, checking the financial viability, providing appropriate incentives to people and developers, reaching agreement with stakeholders, and implementing the project. The above requires systematic, professional approach and it is basically a medium to long term project. In Indian cities, redevelopment has not been happening (Hindman, et al., 2015) at the desirable pace due to host of issues especially lack of strong political will. Authorities need to come-up with more attractive incentives, demonstrate the transparency and providing timely compensation (if applicable) and build credibility among the stakeholders to bring stakeholders to a common agreement. Consensus building among the land owners for redevelopment is an arduous and long drawn process. There is a need



for a separate development cell with experienced technical / managerial staff to exclusively focus on redevelopment issues which is missing in Indian cities.

Timely implementation of land-use and transit integration is critical and it shall be ideally carried during construction stage of mass transit itself. Master Plan shall provide adequate proposals to improve access to the stations in terms of access roads, and dispersal at the transit stations other-wise resolving the same in future will be more challenging and costly.

Deficiency of existing urban infrastructure in Indian cities such as roads, water, sewer line, storm water drainage, solid waste management, etc., is coming in the way of TOD. Upgradation of infrastructure is pre-requisite for TOD. (MoHUA, 2007). Therefore, as part of TOD projects, infrastructure needs to be upgraded to accommodate additional population and employment. The development of urban infrastructure in India has not kept pace with the pace of urbanization. As per the High Powered Committee on Urban Infrastructure and Services in Indian cities, Indian cities required massive investment for upgradation of infrastructure. This works out to be Rs. 43,386 per capita. (Ahluwalia et al., 2011)

In order to implement TOD projects, land acquisition will be required along the mass transit corridors to accommodate metro stations, multi-modal integration facilities, street development and multi-modal hubs, etc. Land acquisition in urban areas is extremely difficult given the high land prices and issues related to rehabilitation and resettlement (Goswami, 2011). In order to overcome these issues, attractive compensation shall be offered like FAR bonus, TDR, alternative relocation options and cash compensation, etc., considering the overall project benefits. More often, land acquisition is avoided compromising on the project objectives. For example, shifting of the Metro Station away from identified high potential area or skipping the station altogether.

## 2.2 Master Plans

Well-conceived and formulated Master Plans are critical for city development and for TOD. However, there are many deficiencies in the existing Master Plans which need to be addressed for successful implementation of TOD projects.

Master Plans or Development Plans in India are prepared for long term i.e. 20 years period. It is not uncommon that few cities follow the outdated Master Plans in the absence of new Master Plan which takes several years for legal sanction. The general approach of Master Plans has been deterministic and expects the urban development to follow the Master Plan. More often, ground situation presents different picture. Urban development is driven by socio-economic and real estate market dynamics which are ignored in preparation of Master Plan (Nallathiga, 2016). The review of Master Plans prepared in the past reveal that actual development has deviated from what is envisaged in the



Master Plan primarily due to development dynamics and not implementing the projects envisaged in the Master Plan. Further, no financing plan or business plan is prepared for its implementation. Therefore, in the absence of clear Business plan, Master Plans have largely remained as vision documents.

Master Plans normally have strategic road network plan and do not have detailed development plans i.e. Local Area Plans<sup>1</sup> for development of access roads to transit stations. This has been affecting the accessibility to transit stations and development of multi-modal integration facilities. For example, Chennai Second Master Plan, does not have any plans for access road improvements to suburban railway stations inspite of the fact that suburban rail network has been developed and operational for several decades (CMDA, 2008).

At present, around 680 km of Metro Rail (with 540 stations) is operational and further 580 km Metro is in various stages of construction in Indian cities (Metro Rail Guy, 2020), however, no Local Area Plans are available for these station influence areas. In addition to above, currently, more than 2500 km of suburban rail network is operational and there is a proposal to expand the suburban rail in various cities including Bangalore where Indian Railways has approved 161 km length of the suburban rail network. Delhi is going to be connected with satellite towns with Regional Rapid Transit System (RRTS). First High Speed Rail connecting Mumbai with Ahmedabad (with 508 km length and 12 stations) is under construction and there are plans to expand the network to other potential corridors connecting the major cities. The DPR for semi-high speed in Kerala connecting state capital with Kasargod (over a length of 531 km, 11 stations) has been prepared and Kerala government signed MoU with Indian Railways to implement the project. Thus, rapid expansion of mass transit corridors presents enormous scope for preparation of local area plans (LAPs) which is an essential component and pre-requisite for successful implementation of TOD. However, only Delhi Metro Rail Corporation (DMRC) has prepared the local area plans for 2 stations i.e. Karkardooma and Sanjay Lake (HUDCO, 2016). Recently, under AMRUT Mission, 25 cities have been selected for preparation of local area plans. Major challenges identified for preparation and implementation of local area plans are lack of appropriate capacity at the state and local level, lack of revenue sources, issues related to land readjustment and land pooling, legal framework, consent of stakeholders, etc. (MoUD, 2015).

There is also a severe shortage of technical manpower in the local bodies / development authorities who are responsible for preparation, implementation

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<sup>1</sup> *Local Area Plans aims at enhancing the quality of life of the existing built environment located immediate to the transit stations and promote compact and high density development by adopting concepts like infill development, re-development and green field development. The enhancements are in the dimensions of built-up density, natural environment, economic opportunities, accessibility and walkability, infrastructure services, housing options, recreational facilities etc., (ITDP, 2012).*





of the Master Plans. Authorities prefer to prepare the Master Plans with in-house capacity rather than seeking external help, this may not be right approach given the weak technical capacity (Planning Commission, 2011). Innovative approach and best practices in urban development are normally missing in the Master Plans. Traditional approach of matching demand with supply with urban sprawl is followed. Lack of futuristic approach and appreciation of real estate dynamics are resulting in loss of revenues to the local and regional development authorities. Most of the development authorities' energies are spent on processing the building approvals leaving little time for visioning and strategic planning.

Often, Master Plan intent and its recommendations / guidelines for implementation does not match. Though, TOD is normally mentioned as one of the broad land use strategy, but the same is not supported by area-wise detailed strategies and guidelines to transform intent to reality. For example, Bengaluru's RMP-2031, discourages the densification and commercialization of economic centers within the outer ring road which is in complete contradiction to the concept of TOD i.e. to promote high density and compact development (BDA, 2017). Similarly, Chennai Second Master Plan promotes densification at outskirts and advocates reduction of density in the core areas. Thus, there is a dichotomy in land use strategies adopted by authorities (CMDA, 2008). There is also no clear cut definition of threshold density and carrying capacity of Infrastructure.

Development Plans in most Indian cities promote outward growth i.e. peripheral development around urban fringes and satellite towns and there is no strategy to optimize the available infrastructure in developed areas by redevelopment. This is resulting in urban sprawl in the form of ribbon developments along the major radials and promoting private vehicle growth due to inadequate investments on public transport. The above can be witnessed in Indian cities like Delhi, Pune and Bangalore which are expanding at alarming rates of 54 sq km / year, 42 sq km /year and 39 sq km/year respectively (Mehta, 2018). In major metropolitan cities the transit modal share among the various modes are dominated by private modes (two-wheelers and cars) i.e. ranging from 35-50 %; except Mumbai and Kolkata where the public modes dominate the transit share (Rao, 2016). Thus, current approach towards urban development should change to make way for compact and transit sensitive development.

A master plan and local development plans are the backbone for the transit oriented development. There is a need for reforms in the way we prepare the Master Plan, implemented and monitored. Thus, there is enormous scope for improvements in preparation of Master Plan in terms of level and depth of analysis, use of latest technological tools, flexibility to accommodate the dynamic growth, stakeholder consultations and incorporation of the feedbacks and suggestions and finally preparation of Business Plan for implementation of Master Plans.



### 2.3 Development Control Regulations and TOD Guidelines

Development control regulations, TOD Guidelines, urban policies and strategies are critical for successful planning and implementation of TOD projects.

Development control regulations (DCRs) needs to be revised in line with spirit of TOD along the transit corridors to avoid the ambiguity. At present, except Delhi (DP-2021), Ahmedabad (DP-2021), Kochi (Draft DP-2031), Pune and Nagpur (DP-2032) (MoHUA, 2020), cities have not included the detailed TOD guidelines in the Master Plan and other cities have merely included few guidelines to facilitate the value capture mechanism. Further, the TOD guidelines formulated are mostly *ad hoc* without in-depth study.

While on one hand TOD guidelines appear to provide higher FAR to promote high rise development and on the other hand, they include many conditions / constraints which make it almost impossible to utilize the higher FAR. For example, though benefit of 4.0 FAR for all properties lying within a distance of 150 m on either side of Bengaluru Metro alignment has been sanctioned in the Master Plan, but in practice, utilization of 4.0 FAR is not feasible due to existing land use developments, other conditions which makes it difficult to get approvals for example from fire department, etc. Therefore, these provisions mostly remain on paper. The reason for lack of proper response for guidelines is due to lack of consultations with the developers and end users. Guidelines are normally released unilaterally without any consultations.

As per TOD guidelines for Lucknow, FAR of 4.0 (including premium FAR) is allowed for a minimum plot size of 0.5 ha within 500 m of the metro corridors in the Developed / built-up area whereas for new/ undeveloped areas (mostly outskirts of the city) permissible FAR is 5.0 for the plot size of 4.0 ha (Government of UP, 2015). The argument for providing higher FAR at outskirts is infrastructure can be developed at the outskirts whereas development of infrastructure in developed areas is difficult. This leads to contradiction as higher FAR at outskirts promotes urban sprawl and encourages the use of private vehicles. Further, minimum plot size of 0.5 ha in developed areas and 4.0 ha in new / undeveloped areas is unrealistic considering the current development pattern. The guidelines should be realistic and take into account the ground realities.

There are no consistent criteria followed for provision of higher FAR along the transit corridors. While, higher FAR is permitted, in several cities along the strip of influence area on either side of the metro corridor, the same benefit has not been extended to suburban rail corridors / stations and bus terminals. The width of strip on either side of Metro corridor also varies from 150 m in Bangalore, 200 m in Ahmedabad to 500 m in other cities like Chennai, Pune, Nagpur, and Lucknow etc. Further, the minimum abutting road width required to avail the higher FAR also varies for cities. While Ahmedabad, Gurgaon, etc. have no requirement of



availing the higher FSI, cities such as Chennai, Pune, Lucknow, Nagpur, etc., require a minimum road width of 9-30 m.

In Chennai, as per the latest Tamil Nadu Combined Development and Building Rules, 2019, premium FAR is based on the road width alone. Though, premium FAR of 50% of the base FAR is applicable for Metro corridors at 50% of the guidance value, the same is applicable without Mass transit system. It also states that to allow transit sensitive developments, government may prescribe such regulations, including premium FAR at concession rates as may be necessary from time to time. Further, the benefit of premium FAR is not extended to suburban rail (at least part of the urbanized area of CMA) and transport terminals such as bus terminals, etc. While, Indian railways have invested in urban transport and in several cities, running the services at highly subsidized fares incurring huge operational losses and played critical role in directed urban development along the railway line corridors but they are not beneficiaries of the investments made on transport.

Indian cities have adopted uniform FAR due to lack of detailed study at plot level, ease of implementation and avoid the litigation. However, FAR potential varies from plot to plot or group of plots and therefore, ideally plot based differential FAR should be adopted based on the individual plot sizes and abutting road widths. This would promote high density development near the transit stations and as the distance increases, there will be a gradual decrease in density from high to medium. Seoul, Hong Kong, Singapore, etc., have adopted this concept where the FAR ranges from 2.0-10.0. FAR adopted near the transit stations varies from 8.0 - 10.0, adjacent to the corridor FAR varies from 4.0 - 8.0 and away from the transit station and corridor, FAR ranges from 2.0 - 4.0. (Gaun, 2015) (Jung, 2019) (U.R.Authority). Though, very high FAR utilized in several international cities may not be applicable to Indian cities due to development patterns and population density, but it clearly demonstrates the need of graded FAR.

Further, it is evident in few cities that the TOD norms are prescribed in isolation without taking into account the existing plot sizes and road width. Any guidelines presented should give overview of the prevailing development pattern and prescribe the appropriate modifications (UTTIPEC, 2012). Unfortunately, the development control regulations and various guidelines in Indian cities are prescribed ignoring the existing ground conditions.

Plot sizes in most of the Indian urban cities are fragmented and small due to the inorganic development pattern. Permissible FAR in some cities in TOD zone is allowed subject to minimum plot size and road width and whereas it is not the pre-condition in other cities. The development control regulations ignore the ground realities and propose unrealistic plot sizes for utilization of higher FAR. For example, minimum plot sizes prescribed for availing the premium FAR



along the TOD corridor in Lucknow is 0.5 ha in developed areas of the city and 5 ha in undeveloped areas i.e. outskirts which is unrealistic especially in core city area. The minimum plot size for Nagpur, Pune, Mumbai and Chennai is 1,000 sq m, 4,000 sq m, 3,000 sq m, 1,500 sq m respectively for utilization of premium FAR. Unless amalgamation of plots happens, it is difficult to get the large plot sizes (CMDA, 2011) (LMRCL, 2015). In this case, development control regulations shall provide attractive incentives for amalgamation of plots which is missing. This minimum plot sizes varies across the cities without much basis. It has been noticed that lack of good responses from developers for purchasing the premium FAR as envisaged by development authorities such as Chennai. It is due to higher premium charges and lack of proper assessment of financial viability and dynamic nature of real estate markets by ULBs / development authorities.

The implementation of proposed revenue sharing formula to fund Metro project is not happening as planned by the authorities. These funds normally go into a common account. Government of Karnataka though took a progressive step of innovative financing of Metro Rail through cess / TDR while sanctioning Phase-II of Bangalore Metro of 72 km through amendment in Karnataka Town and Country Planning Act. (TCPO, 1963) It has proposed a levy of cess and surcharge at the rate of 5 % of the market value of land or land building in future developments to be credited Metro Infrastructure Fund and to be shared by Bangalore Metro Rail Corporation Limited (BMRCL), Bangalore Water Supply and Sewerage Board (BWSSB) and Bangalore Development Authority (BDA) at 65 %, 20 % and 15 % respectively. However, due to lack of enabling notification from state government the funds generated through value capture are not being shared with BMRCL.

Government of Uttar Pradesh has issued zoning regulations, planning norms and building bylaws for mixed land-use and transit oriented development (TOD) in major cities of Uttar Pradesh (Government of UP, 2015). But, these provisions were not implemented so far. It is understood there is no consultation process happened with development authorities before circular was issued. In all the cities, changes in development control regulations have been made through GOs without proper consultations. No Stakeholder consultations including conducting awareness program to explain the rationale for changes and seeking feedback are carried out.

Further, there is no proper database maintained for the documentation of the dynamic changes in land use and other parameters like development mix, plot sizes, open lands, open reserve land (OSR)<sup>2</sup> etc., which pose difficulty in making policy decisions. Therefore, fully GIS based database with access to public shall be provided for transparency and better planning.

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2 *In case of Chennai*



Most of the TOD projects emphasis on the commercial development but what is needed is equitable and mixed land use development. There are hardly any affordable housing projects being planned along the TOD corridors. Affordable housing projects are in fact an important component of TOD corridor as it reduces the impact of gentrification and make the corridor socially inclusive. Delhi TOD policy clearly states the size of dwelling units for EWS. Chennai DCR mentions about mandatory smaller dwelling units in multi-storied buildings. There is a need to define the component of affordable housing by specifying the mandatory smaller size dwelling units. Government can make TOD corridors inclusive and socially equitable for developing the large scale rental housing projects. In this direction, central government has unveiled the Affordable Rental Housing Complexes (ARHCs) operational guidelines in July, 2020. It is estimated that there is a urban housing shortage of about 18.78 million households (MHUPA, 2012). Countries like Singapore, Hong Kong, United Kingdom, Germany, etc. have significant developed rental markets. EWS housing and rental housing needs (for students, working professionals, senior citizens, etc.) are to be encouraged along the transit corridors which are missing so far in TOD projects in India.

From the perspective of TOD, large land parcels under institutional (railway, defence, PSUs, etc.), industrial, trucking, warehousing, etc., and other land uses such as jail, burial grounds, etc., are not TOD supportive developments. This will pose problem in realizing the full potential of TOD. For example, along the Lucknow Metro corridor, large parcels of land is under railways, defence, PSUs (LMRCL,2015), similarly along the Chennai suburban rail (West line from Vysarapadi-Tirunindravyur), large parcels of land is under Railways i.e. loco shed, integral coach factory etc. (CMDA, 2013). Similar scenario is observed in Pune where along the proposed Metro corridors large parcels of land under railways is being used for logistics purpose. In view of above, it is difficult and probably not possible to change the land use to mixed land use in many cases but there is definite possibility of shifting logistics, ware housing, etc., to outskirts from the city center (PMRDA, 2017) but this will require coordinated efforts from the Indian Railways, state governments and local governments.

To plan, design and implement the TOD projects, urban street guidelines, NMT policy, parking policy needs to be prepared and approved by local government. In most of the urban cities, none of the policies exist. Even those cities where it is prepared either it is not yet approved or implemented<sup>3</sup>.

#### **2.4 Traffic Congestion, Population Density, and Parking**

Based on the experience of the authors working in several cities on TOD projects, there has been an opposition to TOD especially with regard to higher FAR from

<sup>3</sup> *Parking Policy for Pune and NMT Policy for Chennai is in place but yet to be implemented.*



stakeholders such as urban local bodies, development authorities, traffic police and line department providing basic infrastructure like water supply, sewerage, etc. This is primarily due to the concern of inability to manage the existing traffic congestion and lack of infrastructure. A comprehensive holistic TOD plan including traffic impact studies will bring all the stakeholders on board which is critical to facilitate the TOD.

Planning should consider the existing population density rather than the FAR as planning tool regulates development. The gross and net density needs to be considered at ward level and further at sub-ward level matching infrastructure availability with the proposed population density. The per capita consumption of floor space is much less in India as compared to international cities due to India's current socio-economic development pattern. For example, per capita space consumption in Mumbai is about 8 sq m as compared to 55 sq m in Manhattan (Patel, 2014) due to the different socio-economic development scenario. Thus, a small change in FAR is likely to result much higher density in India. This is especially true in case of slums where just FAR tool alone shall not be the parameter for planning but population density, indoor crowding and street crowding, adequate lighting, ventilation and emergency evacuation in case fire accidents, flooding, etc. aspects needs to be given adequate attention. Local area plans shall take into account the above issues (Patel, 2014).

There is also a question of population and employment density along the TOD corridors which are already high and additional population / employment that can be accommodated varies from station to station. At some locations, it is not feasible to densify, while for other locations, there is a scope for densification and therefore, assessment of existing density levels needs to be considered and accordingly guidelines needs to be framed. For achieving higher density or compactness, high FAR is normally only mentioned but FAR alone does not guarantee high density. In addition to higher FAR, population density in terms of persons per hectare or dwelling units per hectare needs to be defined. The same is defined in very few cities like Delhi, etc.

Annually, private cars in Indian urban cities are used for about 400 hours (5%) where as are parked for rest of the time. This creates a lot of pressure on cities for providing on-street and off-street parking facilities especially in commercial and institutional dominated clusters (Roychowdhury, 2018). In Indian cities, on-street parking is free and wherever charged, it is very nominal and does not reflect the opportunity cost. As per data, average parking rates per hour in India ranges from Rs 20-60 whereas in New York it is Rs 1,170, Sydney charges Rs 1,016 and Hong Kong charges about Rs 420 (Parkopedia, 2017). This phenomenon is against the concept of TOD as the objective is to promote public transit but due to availability of free parking promotes usage of private modes. Therefore, the need of the hour is price the parking appropriately. Parking policy is one of



the most effective policies for restraining the private vehicle use by promoting walking and public transport use but it has not been capitalized well.

## 2.5 Institutional Issues

As per Indian constitution, urban development including urban transport is under state government jurisdiction. The centre government formulates the policy, provides incentives and partly funds the projects, but the major driving role lies with state government and local bodies. Unfortunately, local governments neither have a technical / managerial capacity to manage the multiple agencies, stakeholders (often with competing and conflicting interests) nor revenue base to implement the projects.

Though Unified Metropolitan Transport Authority (UMTA) has been established in many million plus cities to facilitate coordinated planning and Implementation of urban transport programs and manage integrated urban transport systems, they are largely ineffective and defunct due to lack of delegation of powers and funds (INAE, 2019). As discussed earlier, TOD is a complex urban development project with multiple stakeholders, an empowered UMTA is pre-requisite. Unless, UMTA is tasked with functions such as planning, approval of projects and routing of funds to various implementing agencies, overseeing the progress of work, it will not ensure success of TOD projects.

## 2.6 Issues Related to Financing TOD Projects

Lack of financing of TOD projects remains a major reason for not seeing much progress on implementation of TOD projects. As discussed earlier, TOD projects comprise of short term to long term projects requiring huge funds. At present, urban infrastructure projects in Indian cities are implemented predominantly through capital grants by state and central governments to local bodies (Halder and Rajhans, 2017). These funds are released on ad-hoc basis and there is no guarantee of continuous release of funds to complete the projects on time. Often, projects implementation gets delayed due to late release of funds or stopped altogether.

At present, the local body's finances are so weak that they cannot even think of part funding the urban infrastructure projects. Financing is not possible unless we have a robust revenue streams from the investments to get access to loans from lenders such as banks, multi-lateral agencies.

Major challenge of funding the TOD projects is that there is a significant upfront investments required, but revenues will only be realized over a period of medium to long term say 5 to 20 years period and further, significant benefits are indirect benefits to society which are difficult to capture such as improvements in quality of life and reduction in accidents, etc.



The value capture is backbone of financing for TOD projects all over the world. Based on the world-wide experience, mass transit systems are not viable based on the fare box revenues alone. Non-fare revenues are critical for sustaining the mass transit and develop associated infrastructure surrounding the stations (i.e. TOD projects). The realized non-fare box revenues in Indian cities are low in the range of 6 % to 8 % whereas in case of successful world cities it is in the range of 40 % to 70 % (Agarwal et al., 2017). The successful case studies in India are far and few and the cases where revenue from non-fare sources getting generated, it is only sporadic and not sustained in spite of huge potential due to various institutional, policy and socio-economic barriers.

One of the areas of concern in Indian cities has been the low user charges i.e. parking charges, utility charges and property taxes, etc. These charges play critical role in project development and Operation and Maintenance (O&M). However, reasonable user charges are denied to agencies that develop and provide various urban services due to various socio-economic issues and lack of political will. User charges have been a politically sensitive issue and governments in power shy away from raising the charges to the reasonable levels resulting in deterioration of infrastructure and services. The decisions are based on the short term perspective ignoring the long term sustainability, low and unviable user charges have been crippling the urban transit systems such as bus and suburban rail. For example, due to low fares of the suburban rails across the country, the transit systems are incurring huge losses and are not even generating enough revenues to sustain the operations. Thus, the system is unable to reinvest on the development and expansion even though there is a scope for development in the metropolitan cities on several corridors. Instead, costly Metro rail option is being implemented due to the institutional issues and subsidies. (Gaikwad, 2017)

Lack of reforms such as establishment of dedicated funds, municipal financing, institutional capacity at local levels are becoming a barrier in financing these projects. Local bodies needs to be given share in state government revenues based on certain formula rather than ad-hoc basis. This will ensure predictable and sustainable revenue sources to the local bodies.

No dedicated funds are earmarked for infrastructure development by the urban local bodies (NIUA, 2015). Even the funds collected from various sources like premium FAR, development charges, etc., are not fully spent on infrastructure development.

PPP is one way of overcoming the scarcity of public funds. Medium to long term financial viability is critical to attract the private sector participation and therefore, identification of various components, and packaging them so that it will become attractive to private sector investments is first major step. On the other hand, for success of PPP projects, the government authority needs to





develop adequate technical and managerial capability to oversee the PPP projects especially in preparation of project reports, allocation the risks equitably among public and private agencies (Ramakrishan, 2014). There is a tendency to put most of risks with private agencies resulting in low participation and failures. There is also a need for preparation of tender documents with some flexibility to anticipate the future risks and mitigative measures are adequately defined.

### **3. SOLUTIONS AND WAY FORWARD**

It is clear based on the above discussion, wide ranging issues needs to be addressed to make TOD successful in Indian cities starting from policy changes, institutional arrangement, capacity building, financing options and finally capabilities for timely implementation and O&M. These issues have been briefly discussed below.

#### **3.1 Policy**

TOD policy needs to be prepared and approved, and the same needs to be incorporated in the sanctioned Master Plans. Further, development control regulations need to be modified in consultation with stakeholders adopting best practices, TOD manual needs to be prepared for ease of application on ground. TOD policy alone is not adequate. To complement the TOD policy, host of other policies and guidelines needs to be prepared and adopted by the local governments i.e. urban street guidelines, NMT policy, parking Policy.

TOD requires preparation of local level plans along the transit corridors. There is a need for significant effort in planning, design and consultations.

The proposals of Comprehensive Mobility Plan (CMP) prepared for the city shall be incorporated in the Master Plans. These two documents should be in sync with each other to achieve the land use-transport integration.

Land pooling and re-adjustment are the possible solutions for land acquisition issues where land ownership remains with the owner and only certain portion of land is taken and developed as per the requirement. In return for the land acquired, the feasible compensation methods are (a) grant of additional FAR, and (b) issue of TDR. There is a need to make TDR attractive as so far it has not been successful in Indian cities except in Mumbai.

There is a need to prepare the vision plan and be flexible in development approach. Lack of in-house technical capacity skills in development planning authorities with knowledge of the latest development paradigms and GIS technologies is also one of the bottleneck. Thus, there is a need to strengthen the technical capacity of development authorities with lateral recruitment from outside government framework. There is also a need for regular monitoring of land use and other parameters using GIS tools and disseminate the information for making appropriate policy decisions.



In order to arrest the urban gentrification, in-situ slum redevelopment shall be encouraged. Affordable housing and rental housing shall be made essential component of TOD projects.

Acts and policies alone are not sufficient. There shall be enabling notifications to implement policy issues. Strong political will and commitment is required as TOD is a challenging and comprises of long duration projects.

On-street parking is mostly free in Indian cities and wherever charged, they are very low. Amendments have to be made to local parking policies so as to deter the use of private vehicle use and encourage public transport as a preferred choice.

There is a need for public education on the importance of reasonable user charges.

### **3.2 Institutional Arrangement**

There is a need for an umbrella organization i.e. Unified Metropolitan Transport Authority (UMTA) with adequate powers to facilitate coordination, eliminate overlapping functions and ensure adequate provision of budget for all the modes of transport, integration of public transport modes and research and awareness.

In countries like Singapore, single agency i.e. Land Transport Authority (LTA) is responsible for functions of land use and transport to ensure the integration of the both. UMTA is a coordination agency covering the transport sector but land use is taken care by either the local body or development authority. Thus, both UMTA and local body / development authority needs to work together for success of TOD projects.

In order to focus on redevelopment in urban areas which can revitalise the old areas and release the precious urban land, separate redevelopment cell needs to be created within the urban local body or development authority. Redevelopment is a complicated long term project and establishment of a redevelopment cell will ensure realizing the redevelopment projects.

There is a need for in-house institutional capacity development in urban and transport planning, real estate, financing and PPP to develop and manage the TOD projects.

### **3.3 Financing**

Business plan needs to be prepared clearly identifying the cost and revenue as well as the funding sources and repayment plans. This will ensure funds are available throughout the project implementation phase. This will also provide comfort to the PPP investors who are involved in development and operation of various components of TOD projects.



Revenue generated and collected from the various sources like land value capture, tax incremented financing, betterment charges, advertisements, commercial lease, etc., shall be credited in a separate account that has been specifically established for TOD and infrastructure augmentation. Also, distribution share of revenue among the various urban local bodies towards development of infrastructure should be worked out and agreed among the agencies.

Railways have huge inventories of lands especially in urban areas which can be utilized for value capture purpose. Further, in many cities some of the warehousing and logistics operations located in core areas can be shifted to outskirts and develop these areas into multi-modal hubs with commercial developments. There is a need for granting generous FAR subject to local conditions to railways so that these projects take off.

Revenue generation avenues / instruments appropriate to the city needs to be identified and implemented.

#### 4. CONCLUSIONS

- TOD is a complex urban development project involving multiple agencies and stakeholders requiring massive investments. The shelf life of projects also varies from short term to long term. It involves policy changes, institutional development, provisions for financing and strong political will and commitment.
- Challenges of TOD in Indian cities are multi-dimensional ranging from legacy issues, land use changes, redevelopment, resource constraints, policy issues, land acquisition, institutional, and finally political will and commitment. TOD challenges in India can be overcome through robust institutional framework, innovative financing and stakeholder consultations.
- Given the range of projects, complexity and investments required, TOD projects entail comprehensive planning, stakeholder's consultations and design.

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# Transferable Development Rights: Policy Tool for Strengthening Infrastructure Development

**R. Srinivas, Pallavi Dhandhanian and Anchal Srivastava**

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## Abstract

*There is a notion that Transferable Development Rights (TDR) limits growth, but the truth is far beyond. TDR allows neighborhoods to be planned more efficiently by identifying the carrying capacity of the land and encouraging development in areas where growth is more required. The paper attempts to discuss the concept of TDR and the efforts of the state government to incorporate the provision in their respective Development Control Regulations. In fact TDR is a flexible tool—it can be made to fit many different land-conservation and growth-management set-ups.*

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## 1. INTRODUCTION

Land assembly and development mechanisms are accepted for attaining optimum social use of urban land and to guarantee adequate availability of land to urban local bodies and citizens. Public-Private participation is accomplished in land development through techniques used primarily to prevent the concentration of land in limited hands and encourage its efficient social and economic allocation (Macwan, 2017). Some of the techniques also encourage flexibility in land utilization in response to changes resulting from growing city (Chithra, 2016).

A Transfer of Development Rights (TDR) can be considered a tool to control urban sprawl by concentrating development. TDR is a legal mechanism offered in local government jurisdictions as a form of development control. In addition to municipal land, urban local bodies can also dispose of rights to engage in more intensive land development—a higher floor space index (FSI) or higher Floor Area Ratio (FAR) can be utilized to “finance” and incentivize urban regeneration (World Bank, 2020). Development rights generally refer to the maximum amount of floor area permissible on a zoning lot (Planning, 2020). When the actual built floor area is less than the maximum permitted floor area, the difference is referred to as “unused development rights,” “air rights,” or “excess density rights” (World Bank, 2020). These excess density rights represent the publicly controlled share

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of privately-owned land (World Bank, 2020). These rights have economic value that the public authorities can sell.

## 2. CONCEPT OF TDR

### 2.1 History

Zoning was the first extensive effort to balance distinct property rights compared to the good of society. Early advocates also recommended that Zoning would boost property values. (Karkainen, 1994). The idea of transferring development rights between properties was first introduced in New York city with the passage of that first American zoning ordinance in 1916 (Johnston, 2017). In the United States, the TDR concept was first introduced by Gerald Lloyd (Kaplowitz, 2004). It permitted property-owners to sell their unused land rights to other plots, allowing them to exceed the regulated height and setbacks. In 1968, the City Planning Commission changed the rules to allow transfers between the lots several blocks apart (Johnston, 2017). It also commenced in European countries in the 1950s to develop agricultural land.

In the 1980's India started implementing TDR. Mumbai was the first city in India to introduce TDR in 1991 to develop the slums and other public services where land was being acquired, finding its success as in New York. In India, land acquisition was typically done through land acquisition act, which was unduly a lengthy process, so state government decided to implement TDR, which emerged as an alternative option to get land without litigation. The Ministry of Housing and Urban Affairs coined the *Value Capture Finance Policy Framework* in 2017. Transferable Development Rights (TDRs) are among the policy recommendations adopted at the state and ULB levels.

### 2.2 Purpose of TDR

Land acquisition in urban areas for community purposes is complex, expensive, and consumes a lot of time. To attenuate the time needed and to enable a process, which might be favorably put into preparation to acquire land for preservation purposes mentioned:

- Landmark preservation;
- Preservation of fragile lands;
- Open space preservation;
- As a tool for land use regulation;
- As a method of encouraging the construction of moderate and low income housing;
- As a method of regulating the location and timing of the community growth; and
- To provide for the acquisition of land under reservation for urban services.

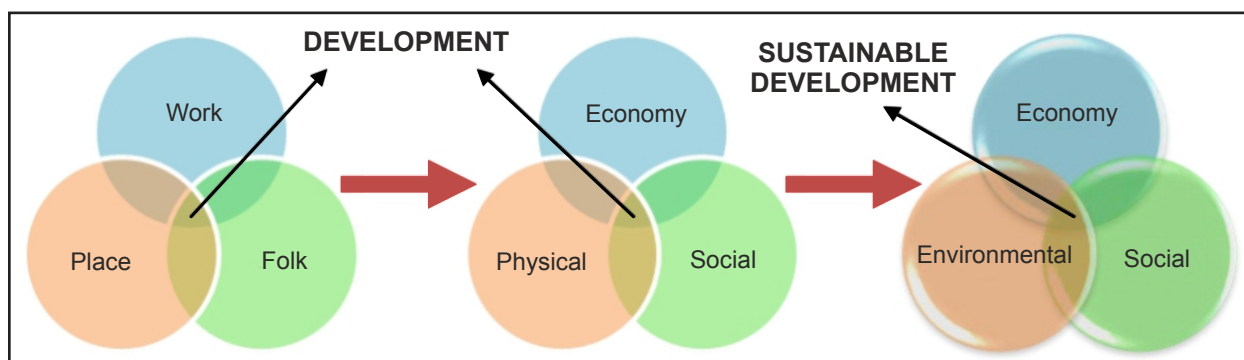
### 2.3 Accountable Land within TDR

The accountable land within TDR include:

- Road;
- Amenities like community space, hospitals, parks, and playgrounds, etc.;
- Heritage properties;
- Slum redevelopment projects;
- Reservation; and
- Agriculture.

Instead, suppose the concerned landholder surrenders the land free of cost and in imaginative condition; in that case, he gets the TDR which is equivalent to the development potential of the land on the given date. Additionally, suppose a particular landholder constructs a public amenity on the land at his / her entire cost in conformity with the Planning Authority requirements. In that case, he / she gets an additional component of the TDR as per the guidelines of the state.

Fig. 1: Sustainable Development



Source: Authors

TDR-is as a development Tool and is used for two main objectives:

- As a planning tool; and
- As a financial tool.

### 2.4 Benefits

The TDR policy allows landowners to separate the right of ownership of the land from the right of its development. A farmer can continue to farm in his land while giving up his/ her development rights to a property developer as TDR for consideration.

Local governments can use TDR to undertake development in specific zones. This tool proposes to preserve: farming areas; forested areas; heritage areas; recreational/ open spaces, and; public-semipublic buildings, etc., by allowing its owners to surrender their rights to develop these spaces commercially *in-lieu* of TDR.





### 3. TDR: A MUTUALLY BENEFICIAL POLICY

It is a two-way communication policy, in which one not only helps in the development of the city but also would be beneficial to an individual. It is a fact that people want immediate results, for which the compensation to the landowners given against their development rights should be market price based. To ensure there is no uneven development in the city, this program needs to be equitable to all parts of the city.

On the other hand, once the land is utilized, it is for the betterment of the city, like if a hospital is proposed and made, it will provide services to all the people. Lack of awareness leads to a lack of contribution to this program. There ought to be well-planned communication to make people understand and participate into TDR programs. Private banks and exchanges must be involved to drive the TDR program. The fundamental principle is that the owner continues to own the land.

#### 3.1 Benefits to Urban Local Bodies

- Monetary compensation is avoided when the property owner opts for TDRs;
- The acquired land is available free of title disputes, encroachments, and encumbrances; and
- In a situation of appreciating the property prices, the instrument would incorporate land value appreciation.

#### 3.2 Benefits to Property Owner

- Compensation is given in the form of the buildable area which can be sold. This amount is usually higher than what the owner would have been compensated for.
- Time taken is less for the entire procedure, and the owner gets the rights faster.
- Fact: As per the current law, properties can be acquired for road-widening only under TDR, and TDR can be enforced only if the owner is willing. If he / she is not willing, the only option for the local government is to acquire the property under the state's Land Acquisition Act. For instance, if a property owner in Bangalore is unwilling, the only option open to BBMP is to acquire the property under the Karnataka Land Acquisition Act. The acquisition of properties under the Karnataka Land Acquisition Act is costly, tedious, and time-consuming. The TDR program allows landowners to separate the right of ownership of the land from the right of its development. TDR is granted only for future development and not for past developments. It is designed to steer growth, not to limit or stop development. (Team, 2010)

### 4 TYPICAL TRANSACTION FLOW

Transfer of Development Rights (TDR) is a zoning technique used to permanently protect land with conservation value by redirecting development that would

otherwise occur on this land to an area planned to accommodate growth and development (PA, 2012).

TDR has been developed since 1916 when a spate of skyscrapers blocked sunlight from neighboring properties in New-York. It is evolving since and started with three essential components:

- **Sending areas:** The areas targeted for increased conservation or the area where the rights will be received.
- **Receiving Areas:** The areas targeted for increased development, or one can say, the piece of land on which the rights are issued.
- **The Transfer Systems:** The rights themselves or a transfer system that facilitates the valuation and transfer of development potential from one piece of land to another.

Some researchers like Greenaway and Good (2008) suggested a fourth fundamental component as:

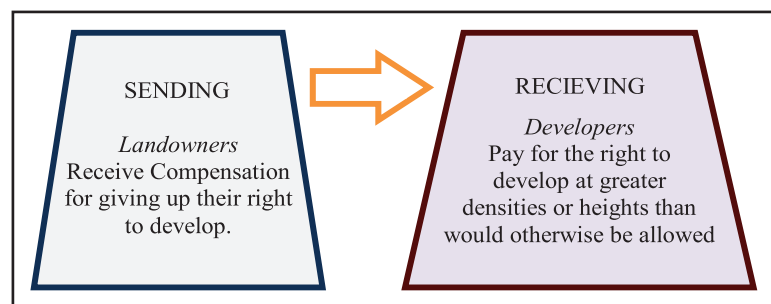
- An overseeing body that develops and maintains the principles of the program and use of the tool is the TDR policy (Greenaway, 2008).

Like it is said, in planning, that a city is an evolving organism, having a social, physical, economic, and political aspect. An excellent administrative control via a technical person and a good administrative control via a technical person and an elected representative becomes crucial for the success of any policy.

Over time, the components of TDR kept on changing and adding, with the present scenario being more in detail:

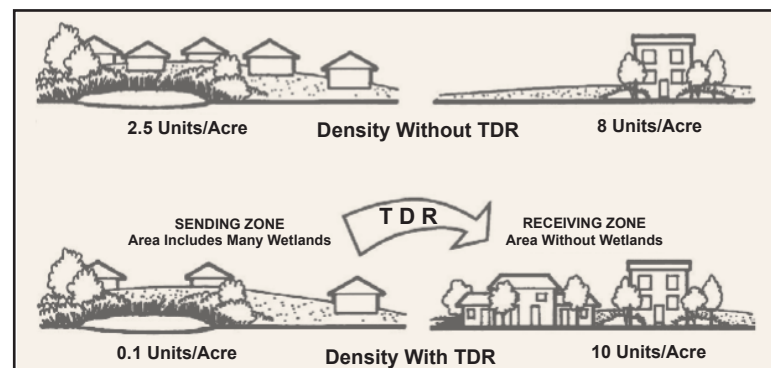
- Goal-setting;
- Sending sites;
- Receiving areas;
- Development bonuses;
- Allocation and exchange rates;
- Transaction mechanisms; and
- Conservation easements.

Fig. 2: TDR Zones



Source: Author

Fig. 3: TDR Zones



Source: (Sina Sahab, 2018)



#### 4.1 How it works

Now, when the rights of development are disconnected from a piece of land or the sending area, whether they are used in the receiving area or expires (in some states, there are capping in terms of years as till when the right should be used), the sending area will always have a development restriction, allowing permanent protection of that land. This restriction or conservation legality on land bars present and future owners from all identified actions and land uses.

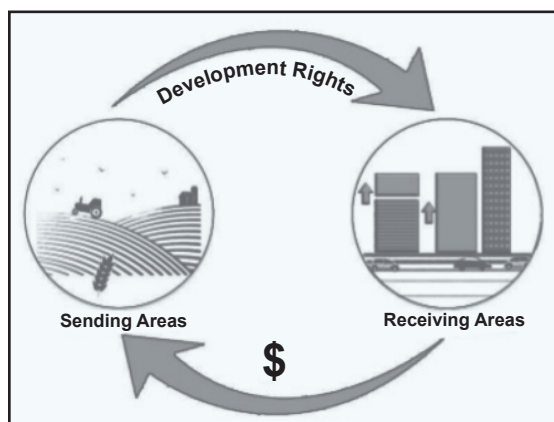
There is a notion that TDR limits growth, but the truth is far beyond. TDR allows neighborhoods to be planned more efficiently by identifying the carrying capacity of the land and encouraging development in areas where growth is more required and most appropriate. For example, In Transit-Oriented development corridors, it is preferred to have commercial places near the stations and residential behind them. It improves walkability and creates eyes on the street for security and safety purposes. These are just a few of the many positives.

#### 4.2 TDR is a Flexible Tool

TDR is a flexible tool and can be made to fit in many different land related aspects like conservation and growth-management set-ups.

- Development rights can be transferred to residential or non-residential developments Residential developments using TDRs typically include:
  - Added uses (e.g., Row housing or community place with single-family detached units residential complex),
  - Special uses (e.g., continuing care retirement communities, day-care facilities, etc.),
  - Increased density (more dwelling units per acre in housing or individual house set-up),

Figure 4 : Transferable Development Rights



Source: (Sina Sahab, 2018)

- Flexibility with zoning area and bulk standards (variations on FARs, setbacks, lot sizes, etc.);
- Non-residential developments using TDRs typically take advantage of
  - Increased floor-area allowances,
  - Maximum building-height allowances, or
  - Maximum impervious lot coverage allowances, and
  - Heights of stilt parking allowances or mechanical parking lots.



Traditional or Euclidean Zoning is based on the concept that each space should have one - Singular use and focuses on the type of use allowed on the land. Form-Based Zoning encourages mixed-use and focuses on building form related to street scape and adjacent uses (List, 2016). TDR goes beyond traditional zoning by compensating owners who give up the development right and mitigating many of the public costs, as a 'least cost' option and is considered as a tool for controlling urban sprawl by concentrating development, while also regulating form-based zoning, making sure that our limited resources are utilized sustainably.

### 4.3 TDR Market

Cities like Mumbai do have a considerable TDR market in place (HDFC, 2020). As these TDR certificates can be traded in the cash market, most developers purchase the same and utilize them to increase their permissible development rights (HDFC, 2020). TDR trading follows the open market principle wherein the pricing is entirely driven by demand, supply, and availability (HDFC, 2020).

## 5. NEED FOR TDR - SUSTAINABLE FACTORS

In 1987, sustainability's definition first surfaced as "Development to meet the needs of the present generation without compromising future generation needs." As per Patrick Geddes (a sociologist and town planner, who stated that a city is an evolving organism and coined the term "conurbation" that is "bringing urban areas together"), explained development as a balance between Work, Place, and Folk, in which work represents economy, Place denotes physical aspect and Folk signifies the social aspect. The physical aspect mentioned earlier includes open spaces, water bodies, recreational spaces, and others that need to be restored, retrofitted, and maintained, thus replacing it with the environmental aspect. As per Sustainable Development Goals 2015 of United Nations, Goal 11 states "Sustainable Cities and Communities" where sustainable is "Social," Cities are "Physical, economic and environmental" and communities are "comfortable sums of the urban population."

The fact remains that to bring about all the three components together, one crucial element is required - governance, in which powers are decentralized - i.e., redistributed to local government bodies.

### 5.1 Understanding the Social Aspect of TDR

TDR is voluntary; people can choose to participate at liberty as per their requirements. The owner of the land has a right to develop his / her land as per current zoning without participating in TDR, and for example, the owner accepts TDR. Yet, the developer on the receiving end does not require additional density or the right provided, they can decline, without hampering the legal rights of the sending area owner. (Theilacker, n.d.)



The sending area owner is compensated relatively, as there are rigid land-use regulations that are politically feasible and easier to implement against zoning. In zoning, all stakeholders have to adhere to the rules, and it at times causes unfairness by benefiting some landowners while limiting others. Also, zoning changes over time, and it is difficult to negotiate with the government agencies. But TDR is easier and predictable; the developer can easily purchase additional density by buying development rights at market rates, benefitting both parties.

### **5.2 Understanding the Economic Aspect of TDR**

TDR is market-based and relies on the private developer of the receiving areas who acquire more significant development potential and does not require government funding, unlike the PDR (The Purchase of Development Rights) programs that the Government uses with limited public funding to compensate the owners of the sending areas. TDR allows the market to decide what parcels to be preserved without reducing total growth and yet containing urban sprawl. The developer gains more density or height than that in zoning regulation. From the aspect of governance, the income of associated departments will boost from receiving the transaction fee.

### **5.3 Understanding the Environmental and Cultural Aspect of TDR**

Although TDR is voluntary, it is permanent which uses deed restrictions or conservation easement for the eternal safety of the plot. Once the development right has been transferred, the owner must follow the rules strictly. Whether a developer wishes to use the additional benefit or not, they shall possess the transferred right until the year specified in the deed. Once the deed ends, the rights are not transferred back to the sending area irrespective of whether they are utilized. It can be used to protect land or buildings under threat of development or any other resources that a community wants to preserve. For example, in the USA, 191 TDR programs targeted environmental and farmland conservation, 15 programs are oriented towards historic preservation, and 12 focus on infrastructure and urban design.

## **6. LAND ACQUISITION ACT: DIFFERENT FROM TDR**

Development is essentially about change. But it is not just any change, but a definite improvement - a change for the betterment of every section of the society. To reach where we are today, we have brought about significant changes in our social, political, and economic aspects. (Kumari, 2014). Land Acquisition is acquiring and developing land and is a useful Value Capture method to mobilize resources. Different methods are adopted by the states or the urban local bodies to acquire land for multiple schemes.

Land acquisition for development projects leads to the displacement of the population living in that area. Their lives are affected in more than one way. The people depending upon the land, forest, and other natural resources for their livelihood lose their source of subsistence. The development projects often bring



baneful consequences in impoverishment, marginalization, dehumanization, and frustration to the displaced people (Kumari, 2014).

Suppose a land is required for a public purpose, now the requiring body needs to submit a request to the Collector, who will then constitute a committee. This committee will then visit the field, make a preliminary inquiry, and submit the preliminary estimate of the acquisition cost. The state government would establish the SSIAU (State Social Impact Assessment Unit) to study the project.

The process is cumbersome and needs a lot of input from all stakeholders, as it is about the value of all the people of the city and beyond. The public of the affected area then reviews the draft report submitted by SSIAU. Their inputs are not just encouraged but also incorporated in the final report. This top-down and then down up approach makes the policy more engaging, and the best result comes out when the participation of the observers from the area affected comes into play.

If the land is acquired under the act and remains unutilized for five years from the date of acquisition, the Collector decides whether to revert the land to the land bank.

The land is invaluable, as it is static, fixed in area, and thus limited. With rapid urbanization, the demand for this resource increases for infrastructure development, so a requirement to acquire land increases, which requires funds. As authorities do not have adequate funds, which are fixed at a rate much lower than market prices, legal procedures become cumbersome and costly, resulting in delay.

The TDR tool's primary application is not to raise huge revenues for ULBs / planning authorities but rather to support the ULBs in saving the costs required for developing urban infrastructure projects. This is how TDR is different from other mechanisms and is mostly adopted by major cities for re-development.

These land Re-development mechanisms include

- Land Sharing;
- Land Pooling & Re-adjustment technique;
- Incentive Zoning; and
- TDR

## 7. SOME TDR EXAMPLES IN THE WORLD

According to the literature, the first TDR project was implemented in the USA. However, there are different suggestions on when the first TDR was made. According to one view, the first TDR was used in 1916 in New York; by the zoning



legislation, the landowners who could not use their “air right” could transfer it to a neighboring land parcel. By this, the “receiving parcel” was allowed to exceed existing development limits (Johnston, 1997). Another view says that Gerald Lloyd first introduced in 1961; the TDR was first mentioned in the New York City’s Landmark Preservation Law of 1968, which was enacted to protect historical landmarks (Kaplowitz, 2008). Either way, it shows that there is much experience in TDR in the USA. Since its adoption, the TDR method was used on historical landmarks and on protecting agricultural lands and natural areas, which has special natural significance. After the pioneer projects of TDR in the USA, the concept was spread out to many other countries such as France, Germany, Holland, Italy, Canada, China, and South Korea (Falco, 2018).

According to some statistics, in the 1970s, more than twenty TDR projects were implemented in eleven states in the USA. These projects include road construction and the protection of agricultural lands as well. TDR projects made in Maryland, USA, are considered the most organized and successful ones.

### 7.1 New York City

The purpose of NYC’S TDR policies is to preserve historic buildings, create public open spaces, and have urban design goals.

New York has four main TDR mechanisms: zoning lot mergers (ZLM), landmark transfers under Sections - 74 to 79, special district transfer mechanisms, and transfer provisions in large-scale development plans. New York has a series of TDR policies, some of which look as though they were introduced as a political response to specific public concerns or as a way of avoiding opposition from a well-organized group of owners. Some of the TDR schemes have never resulted in a single transfer, and others still in existence would appear to have exhausted the potential for transfers. TDRs do not function in isolation but form part of the range of planning and zoning policies.

One of the key success factors behind a TDR policy in NYC is the demand for development in the receiving areas, which developers can realize only by acquiring TDRs. New York is unique amongst U.S. cities. There is a high level of demand for commercial and residential property, not just from residents but also from investors from elsewhere in the USA and abroad. In international terms, only one other city comes close to offering investors the degree of liquidity in property investments that New York does. That is London, where there is no TDR policy. These are markets in which it usually is possible to off load property investments in most market states. They provide a degree of liquidity for investors that are not to be found in other cities. They are also compared with most cities’ relatively open and transparent markets. For residential property, New York offers a lifestyle that few other international cities can match and a range of luxury properties that are attractive to wealthy non-residents.



## 7.2 City of Livermore, California

The program aims to preserve agriculture, preserve natural resources, prevent further sprawl, provide recreation opportunities, reduce traffic congestion and air pollution, avoid additional expenditure caused by increasing service areas, and preserve the area's unique identity.

The City of Livermore's TDC program is an example of a TDR program that allows a payment in lieu of transfer. Credits in the sending area are allocated based on various factors, including land area, willingness to forgo development rights on one parcel and / or subdivision rights, and demolition of existing structures. Credits can be granted for land that is already under easement, providing that the existing easement is less restrictive than the proposed. On the receiving site, credits are allocated according to the type of housing (more credits required for a single-family dwelling than a multi-family dwelling). An in-lieu fee may be paid for each required transferred development credit, a fee which is reviewed no less than bi-annually. Affordable housing units are exempt from the transferable development credits requirements. (Livermore Development Code, 2010)

## 7.3 Dane County, Wisconsin

The TDR program in Dane County was only adopted in March 2010. Currently, the county TDR programs overlay sending and receiving area districts can be located in unincorporated areas, but the county is encouraging local towns to become both sending and receiving areas. The sending area overlay district includes lands identified in the county and municipal plans as suitable for long-term or permanent agricultural, conservation, or natural resource use and limited or no non-farm development. Some of the key purposes of the TDR program are to (Dane County (2010) Transfer of Development Rights):

- Protect high-priority natural or agricultural resources;
- Reduce spot development of rural land;
- Direct development in rural areas away from areas planned for long-term agricultural use;
- Encourage the efficient provision of services by residential clustering units; and
- Encourage rural housing that is adequate and affordable for persons from a range of incomes.

Facilitate development in rural areas of towns already experiencing or seeking development and encourage the efficient use of land with no history of, or is no longer suitable for, agriculture.

## 8. PROVISION OF TDR IN INDIA

The TDR scheme has effectively addressed the long, complicated, and costly land acquisition process in urban areas for a public purpose. In India, TDR policy





has been introduced by amending the relevant Municipal Act / Town Planning Act/ building regulations by some states. The TDR is, in general, functioning as one of the elements to achieve an overarching urban development objective.

Mumbai was the first city in India to introduce TDR in 1991, finding its success in New York. The Maharashtra Regional and Town Planning Act, 1966 has a provision for granting Transferable Development Rights (TDR) against the area of land surrendered free of cost and free from all encumbrances. Accordingly, the TDR provisions are mentioned in the development control regulations of Greater Mumbai, 1991.

The government of Gujarat modified the Gujarat Town planning Act, 1976, which paved for implementing the TDR method. TDR is being issued for many purposes in Ahmedabad, like slum rehabilitation, heritage conservation, and public housing re-development projects. Similarly, many other states have also adopted the

**Table 1: Provision of TDR in States and U.T.s Building Bye-Laws, Town and Country Planning Act, and TDR Policy**

Sl. No	States / U.T.s	T&CP Acts / BBL / TDR Policy	Chapter / Section
1	Andhra Pradesh	Present Rules in force (As per A.P. Building Rules 2017 issued vide GO.Ms.No.119 (with Amendments 401, 223, and 180)	Chapter - XII - Section 166 to 170
2	Arunachal Pradesh	The Arunachal Pradesh Urban and Country Planning Act, 2007	No Provision
3	Assam	Assam Town and Country Planning Act, 1959.	No Provision
4	Bihar	Bihar Urban Planning and Development Act, 2012. Acquisition of Land by way of Transferable Development Right.-	Section - 67
5	Chhattisgarh	Chhattisgarh Bhumi Vikas Niyam, 1984 (Amendment -2017)	No Provision
6	Goa	The Goa Land Development and Building Construction Regulations, 2010 (Incorporating Amendments up to September 2018)	Section - 25
7	Gujarat	Comprehensive General Development Control Regulations -2017	Section - 9(3)
8	Haryana	Haryana Development and Regulation of Urban Areas Act, 1975. Transfer of Development Rights	Section - 6A
9	Himachal Pradesh	Town and Country Planning Rules, 2014 (Amended up to 2016)	No Provision
10	Jharkhand	Jharkhand Building Bye-laws - 2016: Transfer of Development Rights	Chapter IV - Section - 39(7)
11	Karnataka	Karnataka Government has incorporated Transferable Development Rights in the Karnataka Town and Country Planning Act, 1961 under Section 14-B.	-
		Terms and Conditions for granting TDR under the Karnataka Town and Country Planning Act, 1961 was notified in the Karnataka Gazette on 03.02.2005.	



Sl. No	States / U.T.s	T&CP Acts / BBL / TDR Policy	Chapter / Section
		Further amendment to Karnataka Town and Country Planning Act, 14-B was done with effect from 10.09.2015. Karnataka Town and Country Planning (Benefit of Development Rights) Rules, 2016 were notified on 04.03.2017.	
12	Kerala	The Kerala Town And Country Planning Act, 2016: Transfer of Development Rights	Section - 34(3); Sub Section - xi, Section - 56; sub section ii, Section - 80,
13	Madhya Pradesh	MPTDR Rules 2018 provides for DRC's issue where the Government or its implementing agency takes up any public project. The said rules, 2018 also provide for value capture to support the VGF of the proposed project.	-
14	Maharashtra	Maharashtra Regional & Town Planning Act, 1966: Transfer of Development Rights	Part IV, Section - 4(3) - Table - 12
15	Manipur	Manipur Town and Country Planning Act, 1975	No Provision
16	Meghalaya	Meghalaya Town and Country Planning Act, 1973	No Provision
17	Mizoram	Mizoram Urban and Regional Development Act, 1990.	No Provision
18	Nagaland	Nagaland Town and Country Planning Act, 1966.	No Provision
19	Odisha	Odisha Transferable Development Right Rules, 2015	-
20	Punjab	Punjab Municipal Building Bye-Laws 2018	Section - 4(12)
21	Rajasthan	Rajasthan Urban Area Transferable Development Rights (TDR) Policy -2012	Yes
22	Sikkim	Sikkim Urban and Regional Planning and Development Act, 1998	No Provision
23	Tamil Nadu	G.O No -173 - Directorate of Town and Country Planning - Transfer of Development Rights and Special Transfer of Development Rights. G.O (Ms) No. Tamil Nadu Transfer of Development Rights Rules, 2019.	Yes
24	Telangana	Rule 17 of G.O Ms. No.168, Dt:7.4.2012 and as amended vide G.O Ms. No.330, Dt:28.12.2017	Yes
25	Tripura	Tripura Urban Planning and Development Act, 2018	No Provision
26	Uttar Pradesh	Uttar Pradesh Urban Planning and Development Act, 1972	No Provision
27	Uttarakhand	Uttarakhand Urban and Country Planning And Development Act, 1973	No Provision
28	West Bengal	West Bengal Town and Country (Planning and Development) Act, 1979	No Provision
29	A & N Islands.	A&N Town and Country Planning Rules, 2005	No Provision
30	Chandigarh	Chandigarh Building Rules (Urban)-2017	No Provision
31	NCT Delhi	Delhi Development Authority Act, 1957	No Provision
32	Dadra & Nagar Haveli UT	Development Control Rules 2014	Section - 25(1) Sub-section ii
33	Daman & Diu UT	Daman & Diu Building Model Bye-Laws and Zoning Regulations - 1999	No Provision
34	Lakshadweep UT	Lakshadweep Building Bye-Laws, 2014	No Provision



Sl. No	States / U.T.s	T&CP Acts / BBL / TDR Policy	Chapter / Section
35	Puducherry UT	Town & Country Planning Department has already proposed to bring amendments in the "Town & Country Planning Act, 1969" consisting of the provision on "Transferrable Development Rights (TDR)." In this regard, the comprehensive draft amendment bill is proposed to be placed before the floor of the ensuing Assembly for approval. After approval, the comprehensive amendments to the TCP Act, 1969 will be promulgated. Thereafter, necessary rules for Transferrable Development Rights will be framed and notified.	-
36	Jammu & Kashmir UT	Jammu and Kashmir Development Act 1970	No Provision
37	Leh & Ladakh UT	Town and Country Planning Act yet to be enacted	No Provision

Source: MUT Division, Town and Country Planning Organization, MoHUA, 2021

same. They have been shown in the Table - 1 with documents like the Town and Country Planning Act, Development Control Rules, and TDR Policy.

## 9. CONCLUSIONS

TDR is a winning formula for all. An attempt has been made in this paper to understand and relate to the TDR programs at the Indian and international levels. It has been observed that various factors come into play, depending upon people, place, land usage, etc. The main objective of all cities is the preservation and conservation of land from the perspective of sustainable development.

Though on a conceptual level, TDR seems to be a perfect urban development tool as it facilitated the development of suburban locations. However, few criticisms are a part of it, and developers used it to maximize the saleable area in a few prime spots. This redundant construction has resulted in overcrowding in the suburbs, haphazard and unplanned development, and intense stress on infrastructure - a move severely criticized by the planners and environmentalists. Another critique of the concept is that it has led to an increase in real estate prices. Since the TDR acquisition cost is burdened onto the project cost, the developers increase the final pricing of the project. To check this, the government should have some mechanism to control the quantum of TDR available in the market and the trading price.

Transferable Development Rights programs offer financial compensations to landowners who prefer not to develop a part or all of their land. Such owners are provided with the choice of legally severing their development rights under municipal zoning in return for fair compensation. The parcel of land from which the rights for development are severed is protected permanently through a restrictive covenant or conservation easement. Furthermore, the development value of such portions of land where transferable development rights are



applicable is enhanced. Without the TDR option, it becomes almost unlikely to use the piece of land for re-development and growth in a manner that proves advantageous to society in general and the landowner in particular.

Governments can use TDR to focus on development in specific zones. They can use this tool to conserve farming areas, forested areas, heritage areas, etc., by allowing their owners to give up their rights to develop these spaces commercially in place of TDR. The TDR policy offers an economic opportunity by saving the ULBs from the outflow of enormous funds required to acquire land for public purposes. However, it is not entirely cost-free.

The cost of registering TDRs, developing TDR banks, mapping, provision of infrastructure in the receiving areas, capacity building of officials, awareness generation of landowners, etc., is also a part of the policy implementation. There are factors to be considered in the successful TDR implementation, which are:

- Bonus Development - the extra density or TDR provided must be of something that the receiving owner requires.
- Community benefits in the receiving areas:
  - Adequate infrastructure;
  - Clear designation;
  - Political acceptability;
  - Compatibility with existing development;
  - As per the original development plan;
  - Location as per a viable market and higher density; and
  - Amend to have a receiving area located in another jurisdiction if the sending area is in a community where no more growth is acceptable; and
- Stringent development regulations for sending area.

While implementing, the TDR programs must be implemented synchronously with sound urban planning and zoning regulations, streamlined land title registration, the right pricing for TDR, an efficient trading mechanism for TDR, and good audio-video publicity. The implementing agencies to avoid arbitrary decisions on TDR pricing based on end-use. The process of TDR issuance and purchases should be streamlined. There should be well-planned communication to make people understand and buy into TDR programs. Private Banks and exchanges must be involved to drive it.

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# GIS as a Tool for Master Planning

**Ruma (Chakrabarty) Shukla**

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## Abstract

*The first Master Plan in the country was made for the National Capital in the year 1962. The objectives of master plans are to allocate the land in city for various uses, regulate the development and to propose infrastructure and services. Master Plan is created based on socio-economic and demographic data and lots of field surveys of existing infrastructure, land use and services. The Master Plans are created on Planners perceptions based on data available. In the modern era, when we are looking for a data driven planning and governance, the up-to-date, real time and scientific data shall form the base of Master Plan Preparation. Also it is important that the scientific tools shall be developed for the Master Planning process. The paper focuses on this particular process of Master Planning, that how the collaborative technology of GIS can support data creation from various sources and how the layered information in GIS can be utilized for unleashing the relationship in geographical entities. The GIS analytical tools are the scientific tools for generating the best possible land utilization among the competing demand for land as a resource.*

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## 1. INTRODUCTION

### 1.1 Master Planning of cities in India

The creation of Master Plans for the Indian cities are rooted in the Town and Country Planning Act of the United Kingdom of 1947. The major objectives of these Master Plans were basically detailed land use zoning. In India, the Master Plans are made for a period of 20 Years and are primarily focused on detailed land use zoning. Indian Master Plans are based on population projections and the other socio-economic parameters like average household size, income levels, density of population. URDFPI guidelines have set the norms of residential, space and requirement for industry, commercial place, public and semi-public, recreations, green areas, etc.

The master plan processes of the country has been criticized time and again by different planners, urban experts on the following grounds:

- The present master planning process in India is inflexible because of its strong legal framework. The master plan need to be flexible when development process is dynamic and the dynamic city of master plan needs to be based on data, about different factors which impact the development.
- Master plan ought to be based on a lot of data, the data sources have been traditionally the analogue maps and information from the departments and field survey of different types like traffic survey, socio-economic survey, etc.

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It is also based on census data. The master plan preparation takes such a long time, that till the time the plans are prepared the data became obsolete. According to one estimate the Master Plan for cities like Mumbai and Delhi takes 10 years for preparing. However, in the current time of technological innovations, the Master Plan shall be based on satellite images, drone survey / LIDAR survey, GPR survey and should also depend on live data sets of traffic and transportation and utilities, if it needs to be as per the dynamics of real world. Otherwise, investment on making master plans will go in vain, as it will become more of a statutory document, rather than a tool to channelize planned development of city.

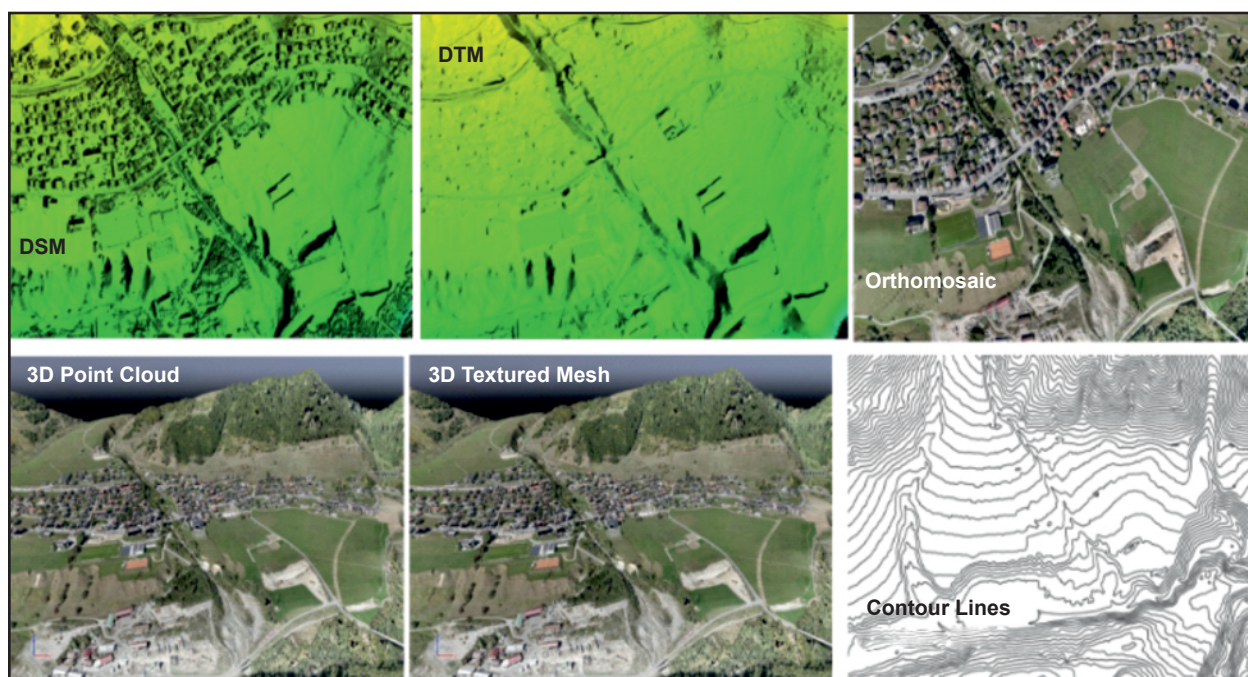
- The Master Plans are controlling documents rather than becoming a force of development. The master plan focuses more on the land use regulation, it does not take care of market forces and dynamic demands of urban services.
- Very little efforts to link investment plans with the existing Master Plan: There are different concepts of development plan and master plan. The development plans are generally linked to investments, while master plans are statutory or obligatory documents. In absence of the financial integration, it is away from the priorities of the municipal government. However, it should be one plan for the city based on economic and investment parameters.
- Master Plans in India are based on population projections, and not on demands of public. The demand is dynamic and changes with societal and developmental norms. It should depend on dynamic data set.
- The Master Plans are majorly the land use plans which are conceptual in nature, the micro-level planning is not considered.
- Land use plan which is based on population projections is responsive in nature and not active based on the current and dynamic demands of economic, infrastructure and services.
- Plan lacks implementation framework: In Indian scenario the master plans are created by the Town and Country Planning Department and its implementation lies with development authorities and municipal bodies. Due to lack of coordination between these urban authorities they are not in agreement as to how the plans are to be implemented.
- Less involvement of community: While making plans, many types of surveys are conducted, but none of it involves public opinion. According to the norms the master plans are to be notified for public opinions, but they are usually notified over newspaper and rarely people get involved in the process.
- More bureaucratic and design oriented than socio economic needs: The Master Plans are made more as a constitutional obligation rather than for guiding plan development.
- Improvement, in existing condition in old city area, is ambiguous and does not provide the implementation framework and micro level planning. Though,

through Local Area Plan (LAP) proposals, government has tried to implement the changes in old areas of the city, but it requires a different type of dealing.

## 2. GIS TECHNOLOGY FOR DATA DRIVEN MASTER PLANS

Master Plans are the output of the planner's perception. Although the perceptions come from the training and experience of the planners but scientific tools for planning are essential for alternative permutation and combinations in planning. Also, GIS facilitates to add data from various sources like aerial photos, drone survey, satellite images, LIDAR, GPR survey, GPS survey, analogue maps, various data sources, APIs, real time data, mobile data.

Fig. 1: GIS ready formats of Drone Images



The drone data provides highly accurate precise and 3-dimensional data for land-based creations. Drone data can be interpreted to provide the digital terrain models, digital surface models, contours, 3D Mesh, point cloud data which can be utilized to study different aspects of topography and built up features for land use planning. Drone2Map of ArcGIS is one such product which helps to generate these outputs from drone images with very less processing time.

Multi diurnal satellite images can help in mapping the growth direction of the cities, whether it is influenced by Transportation, or by land values or by terrain.

Now there are several GIS methods available for studying the real time data like weather, live traffic, which may be studied daily to understand the traffic origin



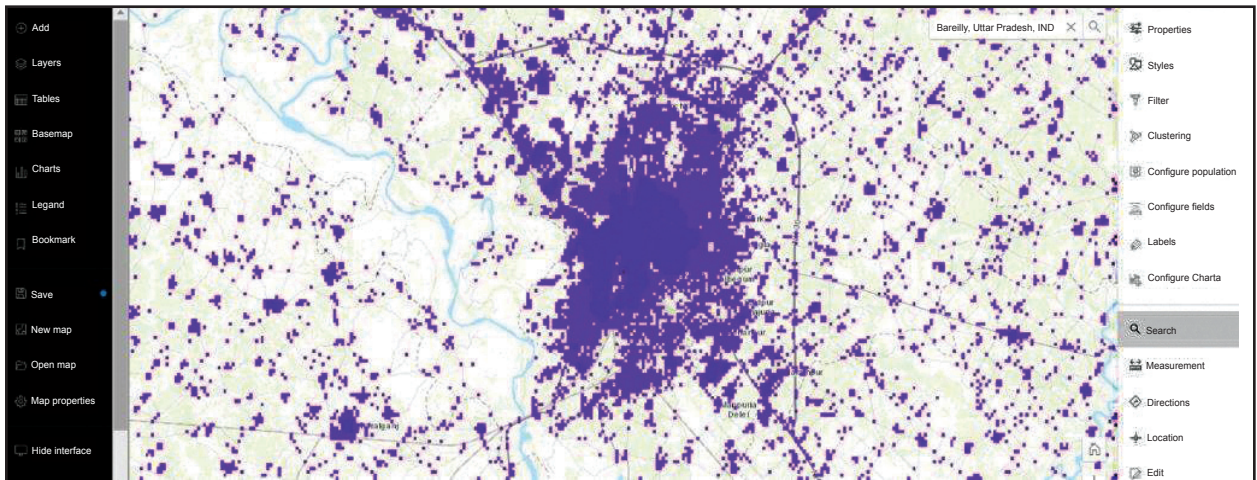


**Fig. 2: Change Detection Analysis using High Resolution Satellite Image**



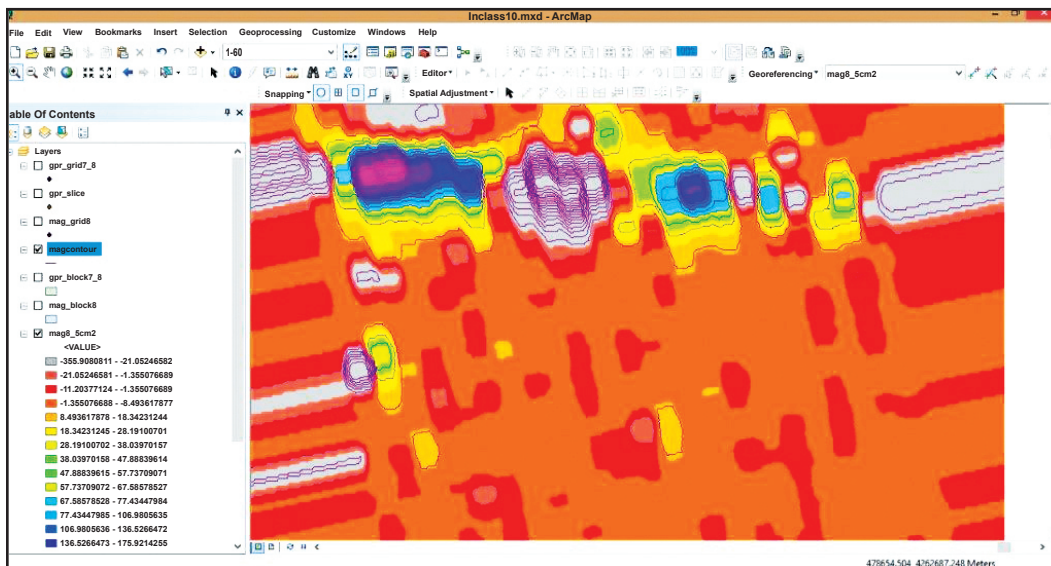
and destinations and traffic flow during different parts of the day, without going to field. There is also availability of several details of earthquakes happening in different parts. ArcGIS living atlas is one of the greatest sources of getting access of different type of satellite Images, the weather data, the earthquake data, the drainage and physiographic data, and recent population of the different cities.

**Fig. 3: Available Thematic Data from ArcGIS Living Atlas for the Population Density of Bareilly (2016)**



Ground Penetrating Radars may help in mapping the infrastructure lying underground like water line, sewage lines, gas pipelines and cables. This helps in mapping these infrastructures which were difficult to locate till recently.

**Fig. 4: GPR Data opened in ArcMap**



The Census data of the towns are now available in digital formats in different open data platforms of the states, which can be directly availed.

GIS technology also helps in collaborating between different agencies for the data availability. It can be integrated with Municipal or Utilities ERP database or flat tables to extract the different set of data.

The Mobile GIS technologies like Survey 123, Collector App available with enterprise ArcGIS server can be configured to capture the existing urban services and infrastructure data along with location of the Asset/ Service along with photograph. The data collected through Mobile Apps can help not only in faster data collection, but also the location enabled data collection. This help in understanding the spatial distribution of the services.

### 3. GIS TOOLS FOR THE MASTER PLAN CREATION

The different GIS analytical tools support the creation of Master Plan in more scientific ways. As GIS can slice the geographical entity into different layers of physiography, lithology, geology, drainage demographic distribution, climate, socio-economic data, land use / land cover, utilities and infrastructural

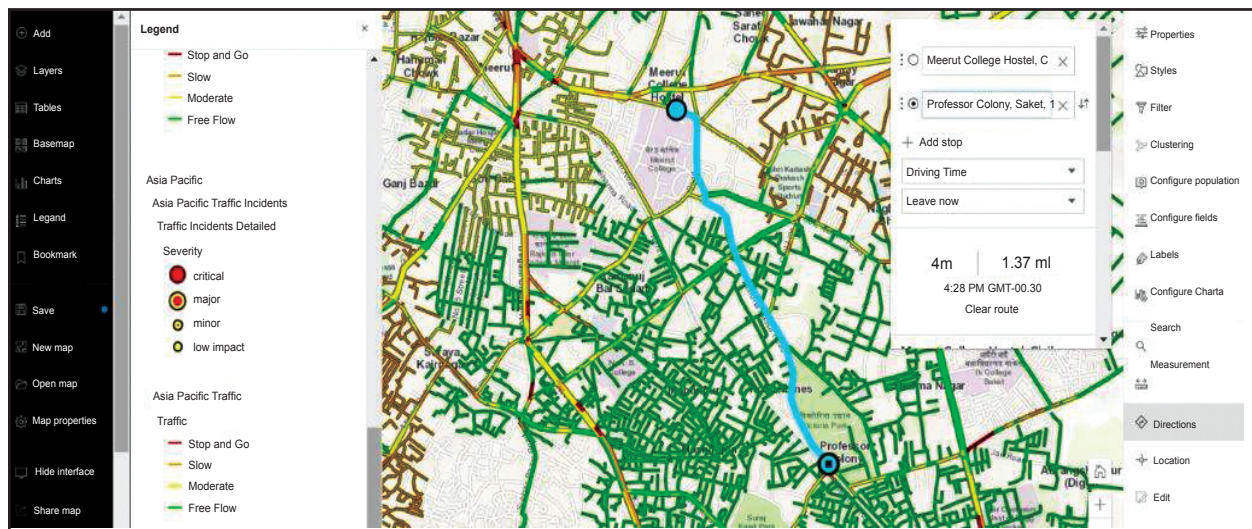
**Fig. 5: Configuration of Surveys on ArcGIS Collector**

TABLE_10_1:	
CITY CODE	<input type="text"/>
CITY NAME	<input type="text"/>
TYPE OF HOSPITAL	<input type="text"/>
NO. OF UNITS_GOV	<input type="text"/>
NO. OF UNITS_PRIVATE	<input type="text"/>
NO. OF BEDS_GOV	<input type="text"/>
NO. OF BEDS_PRIVATE	<input type="text"/>

data, it can help in analyzing each individual layer with its attributes and also help in overlaying the layers over each other for understanding the spatial relationship between the layers.

GIS helps in analyzing the data in thematic context, like simple census data may be utilized to analyze the spread, the density and growth of population over space and time. It helps in doing, zoning, walkability assessment, neighborhood planning, urban designing, modelling traffic flow, congestion analysis, utility coverage, NDVI for analyzing green covers in the city, generating water index for conserving surface water bodies, mapping urban sprawl.

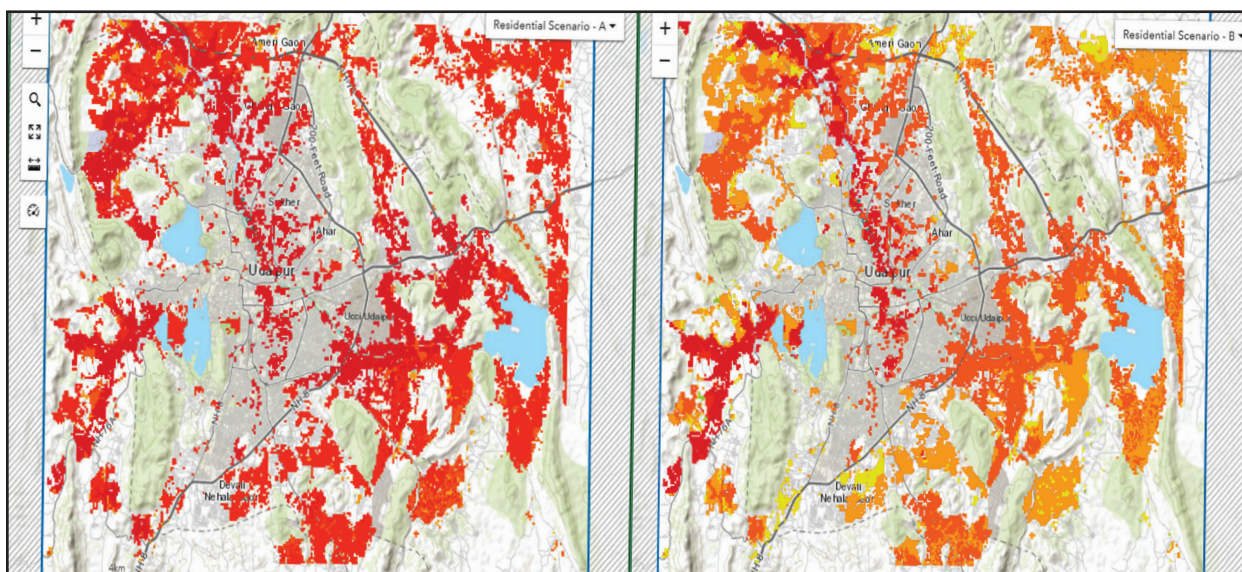
**Fig. 6:** Traffic Data of city gathered from World Traffic Survey of ArcGIS Living Atlas helps in understanding traffic bottlenecks in city.



For proposing the future land use and land cover GIS offers different type of land suitability model based on the permutation and combination of different factors, natural, built-up, and socio-economic. The weightages can be assigned as per the importance of different factors. The weightages can be vertical as well as horizontal, meaning the weightages layer like for proposing residential commercial and industrial land use, the slope up to 15% is suitable, higher slopes shall be used for conservation, like urban forestry, or horticulture. Similarly for proposing the residential land use, existing land use is most important feature, may be followed by slope, ground water, distance from roads and distance from rivers. Thus, the land suitability modelling can help in optimizing the use among competing demand for land from different uses.

GIS technology has now gone ahead in 3D classification of land uses. The Drone / Lidar based survey helps in generating the 3D profiles of the city and the multi-storeyed building can be then sliced to analyze in use in 3D, means in a building

**Fig. 7: Alternate Land Suitability Models generated by changing the weightages of different factors of land use.**



how many units are used for residential, commercial, public, and semi-public uses. This help in better utilizing the city space.

GIS permits to classify each type of land use into multiple subclasses, which were otherwise not possible, this helps to do micro level planning and understand demand of services and land use in a better way. Like GIS can help in analyzing the neighborhood level demand for services like milk booth, convenient shops, crèches, parks, gyms, washer man service, battery *rikshaw* service, these were not considered earlier while making plans. There are GIS tools to do proximity analysis of all these services and immensely help citizens in analyzing the neighborhood services.

Again, dividing the urban activities in micro subclasses based on their location, also helps in analyzing the economic dynamics of the city, the type of economic activities, the cluster of different activities, the available markets, commutation, raw materials, resources. These helps the master plan to include the economic dimensions in planning also, making predictive planning for the economic opportunities. Like several of the cities are coming up with growth corridors, industrial development centres, service hubs. GIS helps to analyze the resource base required to make the growth corridors like land base, infrastructure required, transport Network planning, distance from markets, etc. GIS based classification will help in making a connected city network and interdependence of different economic segments, thereby making the master plans more meaningful.

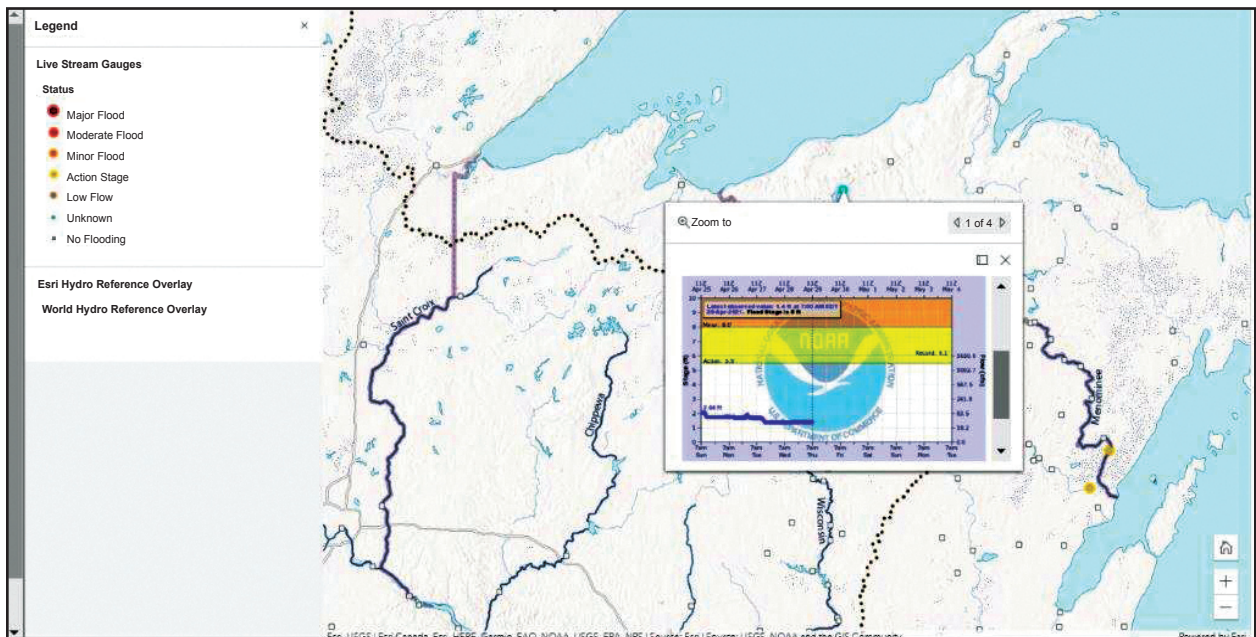


Based on the existing population distribution different density classes can be mapped in GIS and compared with existing provision of urban infrastructure and services and the gaps can be easily identified. Like the water network distribution can be compared with population density and land use classes, to understand the gap in provision. The analysis of the coverage based on location of existing infrastructure and services like buffer around different hierarchy of education and health facilities, as per distance and coverage norms of urban planning suggested in URDFPI guidelines can help in understanding in gaps in location of the facilities, further it may be overlaid on the population density to allocate the newer facilities.

GIS may also help in projecting the population in different part of the cities using different methods according to the development levels of that part and can visualize the distribution of projected population spatially over the physiography to plan for the different urban infrastructure and services in the master plan.

GIS technology is open to interact with the IoT sensors. In future, these are going to be real time data sets on different utility network performances, pollution sensors, flood monitoring sensors, fire sensors, cameras on roads, which will help in generating a lot of data sets. This will help in avoiding the cumbersome process of data gathering from the field and will help in making the Master Plans more robust and demand based.

**Fig. 8: Integration with IoT Sensors for getting Real Time Data for Planning, Integration with Flood Sensors to understand the Urban Flooding.**





Currently the GIS based Master plan is generating a lot of spatial data repository with the town planning department, which may serve as a basis of plan revision and new infrastructure plans with Master Plans as foundations.

As the major points of criticism of Master Plan mentions that Master Plan does not consider the public opinions. In this direction the GIS technology allows to involve the public opinions in two ways, it allows to generate the crowd sourcing Apps to collect the public opinion on any urban planning issue. The Draft Master Plan can be notified over Web GIS and mobile GIS for collecting public opinion.

#### 4. CONCLUSIONS

GIS technology thus acts as a tool for master planning integrating different sources of data spatial and non-spatial into different layers. This supports in generating thematic maps required for spatial analysis related to coverage, density, proximity, generating indexes, etc. There are tools for spatial analysis like land suitability modelling, buffer analysis for location-allocation of facilities, utilities, and urban services; heat maps to understand the density and points of aggregation and dispersion, there are tools for interpolation to understand geographical spread of components between any two points. GIS helps in making the plans much faster and the minute details and layers help in making the Master Plan at greater details (micro level planning). The breaking of layers into different classes and subclasses help in economic planning also. As GIS data integrate data from different sources it helps in better collaboration and coordination. The crowd sourcing apps also helps in involving the public opinions in the master planning. Finally, the Enterprise GIS supports in generating storing, retrieving and utilizing vast amount of spatial and non-spatial database as a base for planning mobility, infrastructure, service with Master Plan as the base data.

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# Land Value Capture: Innovative Financing for Urban Rail

Ishita Aryan

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## Abstract

*The Land Value Capture finance is rapidly acquiring global legitimacy as an ancillary and innovative source of funding for expensive urban transport projects. The economic impacts of public transit investments on surrounding properties make a strong case for transit value capture finance in emerging cities. However, Development Based Land Value Capture type mechanisms have unique advantages over Taxation Based Land Value Capture type mechanisms and vice versa. It is critical that city leaders and transit executives consider the unique advantages of the two types of LVC to ascertain which best fits their local context and funding objectives. The author suggest that alternatively, DBLVC and TBLVC mechanisms can be consolidated to meet a funding objective, while leveraging the strengths of each type.*

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## 1. INTRODUCTION

A good public transport system is often one of the defining features of a city, generating multiple far reached benefits, enhancing sustainable living, and attracting residents, businesses, daily commuters and tourists. Rail based public transport projects such as LRTS / MRTS / RRTS generate large scale economic values for cities and are necessary for long term inclusive and sustainable development. However, even in the case of the world's great public transport systems, fares / 'user pay' do not fully cover costs. Substantial government monetary support, subsidies and loans are required to build, maintain and operate most of the rail based transit systems. This traditional way of urban rail financing leads to a growing debt-subsidy cycle which undermines the economic development.

At the time when urban rail investment appears to be a priority for cities, governments face budgetary pressure leading to challenges in the financing of urban rail. The fiscal challenge for urban rail has prompted cities to find alternative funding and seek different governance frameworks to implement rail projects. Cities are recognizing the potential of urban rail in creating economic value through its multiple non-transport benefits specially its impact on land values and thus its potential for influencing more intensive land development / Transit Oriented Development (TOD) and hence urban regeneration with its associated agglomeration benefits. Innovative financing through 'beneficiary pay' methods have emerged lately to cope up with the crunch of finances for building capital intensive public transport facilities such

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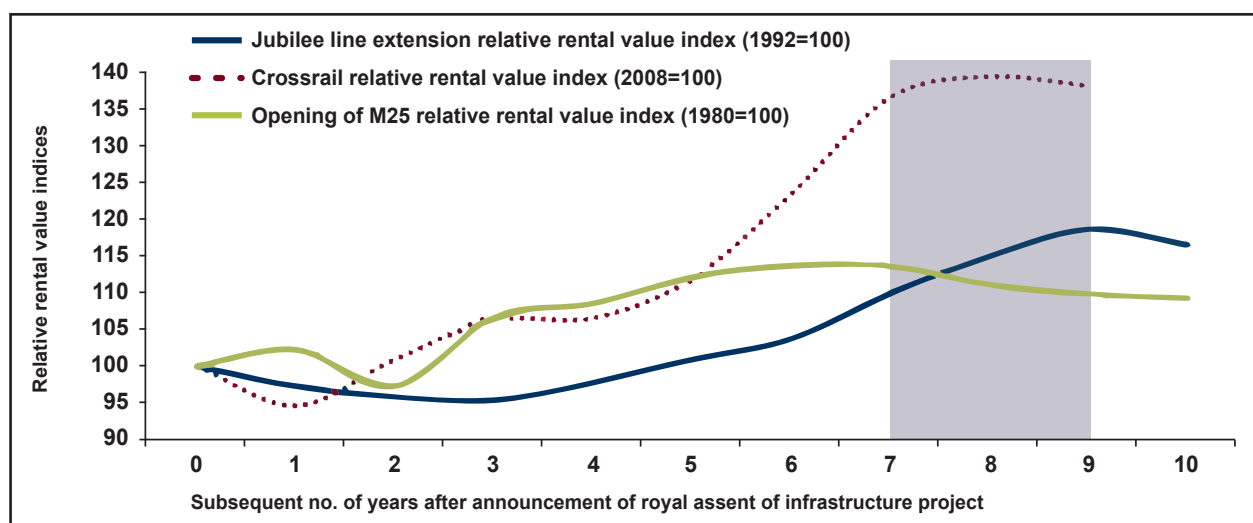
*Ishita Aryan; Urban Planner, National Institute of Urban Affairs*

as Metro and Rapid Rail Networks. Thus it becomes essential for Indian cities to learn from the successful experiences of innovative financing for Mass Transit across the globe.

## 2. UNDERSTANDING THE IMPACT OF TRANSIT ON LAND AND REAL ESTATE DEVELOPMENTS

The LRTS / MRTS / RRTS provide fast, reliable, safe and comfortable connectivity solution to the expanding urban centres. It serves as the integral commuter transport backbone in the region. High speed, significant reduction in travel time and wider reach offers a very different propositions to the spatial geographies. The hypothesis is that even incremental changes in transport infrastructure may encourage both land development and economic growth stems from the concept of the 'accessibility' of locations. The more easily people and goods can access a given location, the more desirable that location is for both people to live and for businesses to locate. This added increment of location desirability will lead to tremendous development in public transport station areas / influence zones - both physical land development and redevelopment as well as economic development. With the coming of MRTS corridors, there is sharp rise in valuations which has been established in various market studies. The enhanced real estate development activity brings in (i) catchment area increase where newer areas becomes accessible, (ii) valuations increase where real estate valuations increases due to increased ease of accessibility, infrastructure development and economic development, and (iii) transaction velocity increase with increase in number of real estate transactions. Till date, in the current market scenario, these rise in land and asset valuations due to public investment are usually captured by private players only.

Fig. 1: The Effect of Transit Infrastructure Projects on Relative Rental Values, London Cross Rail



Source: MSCI



### 3. UNDERSTANDING LAND VALUE CAPTURE

Land Value Capture (LVC) refers to a type of innovative public financing, in which increases in land values generated by a new public infrastructure investment are all or in part “captured” through a land related tax or any other active or passive mechanisms, such as betterment charges, tax increment financing, air rights sale, property development, to pay back such an investment. In other words, Value Capture, in a broader sense, opposes the windfall gains derived out of public infrastructure creation accrued to a privileged few as unearned income, but argues for redistribution of such gains fully or partially to fund public investment and also to compensate social-costs often resulting from these investment negativities. However, the LVC concept is still perceived as a work-in-progress with varied success. As evident from global experiences, this was primarily due to the fact that there is a notional misconception of the Value Capture mechanism as only a financing tool. Mostly they have overlooked the needed support investments for infrastructure integration and the sustainable community living aspects specifically in the case of using LVC for a mass transit project. Land Value Capture can be blended with planning and development framework to bring in the realizations of Transit Oriented Development as well.

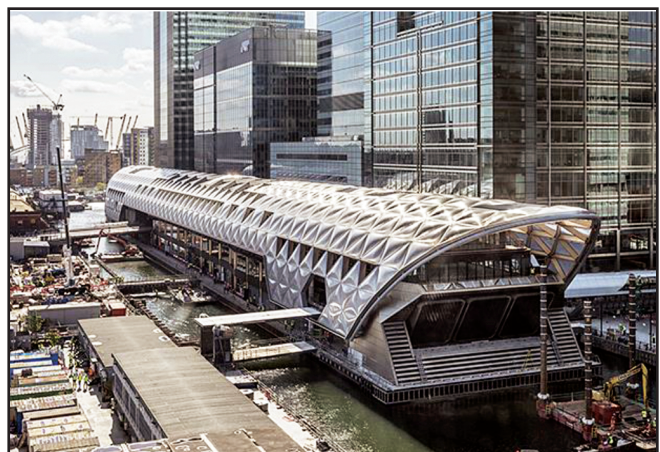
#### 3.1 Development Based Land Value Capture

Development based Land Value Capture (DBLVC) is the type of LVC mechanism where transit agencies or transit investors are directly or indirectly involved in the delivery of development on land around transit stations (George Hazel Consultancy, 2013). Examples: direct property development, joint property development, land sales / auction, air rights sale, land lease agreements, land readjustment, urban redevelopment schemes.

Fig. 2: R+ Property, MTR Hong Kong



Fig. 3: Property Development, London Cross Rail



**Table 1: Development based Land Value Capture: London, Hong Kong, Tokyo, New York, Nanchang and Sao Paulo**

Project Name	London Cross Rail	Rail Plus Property Program	Inclusive Land Value Capture Schemes	Development-Based LVC Practices	Financing a Metro with Development Rights of Public Land	Air Rights Sales
Location	London	Hong Kong SAR, China	Tokyo, Japan	New York City and Washington, DC,	Nanchang, China	São Paulo, Brazil
Metropolitan Population	13.6 million	7.1 million	21 million	4 to 8 Million	2.3 million	11.9 million
Type of Transit	Regional Rapid Rail	Metro (Heavy rail, Light rail)	Regional Rapid Rail	Subway Metro	Metro	Subway Metro
Length of Transit Corridor (km)	118	218	304	223 km in New York and 170 km in DC	168	205 (by 2030)
Public Transit (%)	37	40	51	23% (NY), 37% (DC)	14	37
Project Duration	2017-2021	1980 to 2011	1986 to 1996	1991- 2006	2012 to 2020	2013 to 2040
Ownership	Fully State Owned	80% Govt. and 20% Pvt	Govt. and Pvt	Fully State Owned	Corporation (PSU)	PPP
Company	Cross rail Limited, subsidiary of Transport for London (TfL)	MTR Corporation Limited - 1) Transport Operations; 2) Hong Kong Station Commercial Businesses; 3) Hong Kong Property and other Businesses 4) Mainland of China & International Business.	Corporations, namely Tokyo Rail & Japan East Rail (PSU)	Washington Metropolitan Area Transit Authority (WMATA)	Nanchang Railway Transit Group Co. Ltd. (NRTG), Nanchang Municipal Govt. (NMG): local body	São Paulo Company of the Metropolitan (METRO), São Paulo Metropolitan Trains Company (CPTM), and Metropolitan Urban Transportation Company (EMTU).
Contribution of VCF (%)	25%: Stamp Duty Land Tax	38%: From Property Development Rail Plus Property (R+P)	59%: Revenue from real estate development is 34 % Land Readjustment & Land lease	17 % in DC Additional FAR & Development Rights (TDR, TIF- New York)	70% Proposed: 20 % of the transfer fees of land use rights Sale of development rights, Mixed Land Use	21% Tradable Air Rights



Table 1: Continued

Project Name	London Cross Rail	Rail Plus Property Program	Inclusive Land Value Capture Schemes	Development-Based LVC Practices	Financing a Metro with Rights of Public Land	Air Rights Sales
		of Additional Construction Potential				
	Community Infrastructure Levy (MCIL)		Internalization, Requirement, Integration, Auction	Landmark Transfer-FAR of 1.2-6.6, purchasing unused development rights	Direct Property Development	Urban Redevelopment Areas, called "Urban Operations" (UOs),
	Business Rate Supplement (BRS): Zonal retention of revaluation growth from business rates		Incentivize land readjustment (Gets Added FAR) & to maximize rail's value added. Developer floor area rights	Superior Development Special Permit (FAR:30)	Re-auctions the land sites	Additional building charge, Urban concession
	Development Rights Auction Model (DRAM)		Fuel Tax & Cess on Vehicle Registration Fee	Joint Development (DC)		Betterment levy in Urban Intervention Area (UIA)
Funding Arrangements	State Pooled Fund	Rule of cost and profit sharing between public agencies, MTR Corporation & private developers	Special Urban Railway Reserve Fund	District Improvement Fund, special taxing district	NMG collects fee to Development Funds	Urban Development Fund
Influence Area	Station Areas & Market Zones	400 m : around rail stations vary by location	Vary by development generation, location, and stakeholder	300 m : TOD Zones	TOD Zones: 500 m around station areas	Central Business District , UIA & UO's



### 3.2 Taxation Based Land Value Capture

Taxation based land value capture (TBLVC) is the type of LVC instrument that is used to recover transit induced value gains by imposing taxes or fees on existing developments located in ‘transit investment benefitting areas’ established by the transit agency. (Medda & Modelewska, 2009; Walters, 2012). Examples: cess, taxes, levies like tax increment financing (TIF), Special assessments, land value taxes (LVT), betterment charges, impact fees, station connection fees etc.

## 4. CONCLUSIONS

The Land Value Capture finance is rapidly acquiring global legitimacy as an ancillary and innovative source of funding for expensive urban transport projects. The highlighted economic impacts of public transit investments on surrounding properties make a strong case for transit value capture finance in emerging cities. However, development based land value capture type mechanisms have unique advantages over taxation based land value capture type mechanisms and vice versa. It is critical that city leaders and transit executives consider the unique advantages of the two types of LVC to ascertain which best fits their local context and funding objective. Alternatively, DBLVC and TBLVC mechanisms can be consolidated to meet a funding objective, while leveraging the strengths of each type. Feasibility, equity, efficiency, and revenue capacity and their supporting criteria must be adhered to maximize the utility of any type of LVC mechanism for transit finance. Efficiency and revenue capacity especially underscore the essence of evaluating the revenues LVC mechanisms relative to their costs. This is a critical step towards thinking more economically about LVC finance tools used for financing transit and sustainable urban development.

*I have no need for any industrialization which degrades a human being, and sullies his honour. It would be better if the pace of industrialization slows down rather than that workers should be made to live in these shocking and humiliating conditions.*

*Jawaharlal Nehru*



# Policy Recommendations for Development of Charging Infrastructure and Vehicle Registration Process of E-rickshaw

Kishore Kumar Neelam

## Abstract

*The main objective of this paper is to enclave, a policy recommendation for development of charging infrastructure and vehicle registration process of E-rickshaw. Electric Vehicles are increasingly being considered as the most logical option towards combating air pollution. It would be a smart choice to consider e-rickshaws as last mile connectivity mode in combination with other vehicles. E-rickshaws are welcomed by commuters and operators due to their characteristics of demand responsive and realizing the need for a regulatory framework as there are no rules and regulations to govern this market. This, in turn, is contributing to traffic congestion and unruly driving, risking the life of commuters and bystanders. Charging of E-rickshaw is taking place at the residence of the operators with domestic connection.*

## 1. INTRODUCTION

### 1.1 Objective of the Study

Objective of the study is to analyze the current situation and create a better understanding of E-rickshaws infrastructure. E-rickshaws were excluded from NMT category and included in Motor Vehicles Act (2014) as last mile connectivity modal option. Any market to grow, it requires a policy framework that can guide the sector towards success. So, the current market of E-rickshaw services by understanding the gaps and suggest the necessary recommendations, towards the charging infrastructure development and regulations for the vehicle registration system.

## 2. INTRODUCTION E-RICKSHAW SERVICES

In a very short span of time, e-rickshaws have outnumbered the mode auto rickshaws, rickshaw pullers owing to its unregulated market, low cost and easy availability. E-rickshaws are eco-friendly, more efficient and generate employment. There are no rules and regulations in place to govern this market. Some vehicles do not have number plates, vehicle insurance and driving licence. The combination of these factors leading explosive growth of E-rickshaw, which in turn contribute to traffic congestion and unruly driving, risking the life of commuters and bystanders. Charging of E-rickshaw are taking place at the residence of the driver with domestic connection. This battery-operated vehicle offers rides from residential colonies to main roads in a radius of 2 to 3 km. In a very short span of time, the E-rickshaw in Delhi has outnumbered and presently more than one lakh plus battery operated E-rickshaw ply on the roads. There

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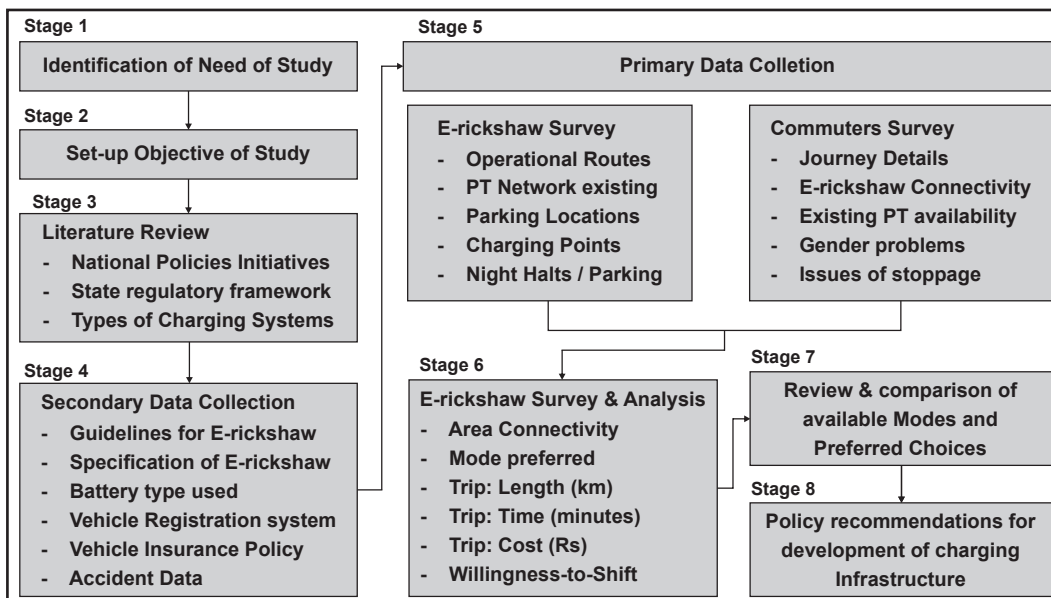
are no regulations or policy to govern the charging methods adopted by these operators and concerns that these might lead to increased cases of power theft.

## 2.1 Methodology

The research methodology involves a systematic process that focuses on objective and in additional collection of information for analysis. So, that the researcher can come to a conclusion. In this process, the study area is documented, reviewed best practices are compared with other data.

- **Stage-1:** In the first stage, identification for need of the study and to develop a research-oriented objective.
- **Stage-2:** The research area may be identified, some knowledge or information that is needed, it serves as the focus for further study process.
- **Stage-3:** Literature review is usually the stage, which focus on the wide range of secondary information related to the data sources such as reference books, journals, online articles, etc. This stage provides foundation and knowledge about the research objectives. The information collected during this stage understands, and identifies the future strategy.
- **Stage-4:** Secondary data collection method need to be selected on the basis of data associated with several alternative methods. The knowledge gained through the review of literature guides the research in clarifying the research project.
- **Stage-5:** Primary data collection needs to be preceded by a level of preparation and pilot data collection may be required in case of survey questionnaires and

Fig. 1: States of Research Mythology





through physical observations. The actual study begins with the collection of data, by providing the information needed to answer the research.

- **Stage-6:** Analysis of data plays an important role in the achievement of research aim and objectives. Data analysis method vary between secondary and primary studies. The results of this analysis are then reviewed and summarized. Then, the data will be analyzed to determine and the results of the study also provide valuable information.
- **Stage-7:** All the time, effort and resources dedicated to are review and comparison of available modes and preferred choices are analyzed.
- **Stage-8:** Conclusions with policy recommendations relate to the level of achievement. It is also need to cover study research limitations and suggestions.

## 2.2 Literature Review and Background

Rapid increase in number of e-rickshaw in cities are projected, as a reason to rising congestion on roads and increased accidents. Considering rising issues related to e-rickshaws, government has initiated efforts to develop a regulatory framework to control e-rickshaw operation. These emerging policies or initiatives at national, state levels are given in Section - 2.3 of this paper.

## 2.3 National and State level Initiatives for E-Rickshaw

### National Level Initiatives for E-Rickshaw

**Motor Vehicles Act, 2014:** Motor Vehicles (Amendment) Act, e-rickshaw were categorized as a separate category of vehicles and defined as three-wheel vehicle used to carry passengers and limited power up to 2000 watts.

**FAME India scheme:** Faster Adoption of Hybrid Electric Vehicles (FAME) was announced by the Government of India to be implemented in phases. This scheme provides subsidy for promoting electric vehicles in India. In FAME-I scheme, it aimed at market creation through incentives across segments of vehicles. It provided subsidy on the purchase of e-rickshaws. FAME-II scheme was sanctioned for setting up charging stations. It aims to support vehicles of all categories; 5 lakh are allocated for 3 wheelers to be used as public transport modes or registered as commercial vehicles.

**Smart Cities Mission:** Under the smart city proposal, the urban local authorities have planned to launch E-rickshaws as an aid for improving the livelihood. Financing for e-rickshaw purchase and deployment were included in Smart city proposal (SCPs). The E-rickshaw can run at a speed of 25 kmph with very less maintenance and promote environment friendly mode of transport and improve the last mile connectivity in the city. Customized finance schemes for E-Rickshaws shall be introduced with the support and guarantee of the government aimed at promoting electric vehicles.

## State Level Initiatives for E-Rickshaw

- **Delhi E-rickshaw Policy:** Delhi has developed following initiatives / policies:
  - **E-Rickshaw Sewa Scheme:** The scheme stated that vehicles bought before 2014 can get a certificate of road-worthiness from their manufacturer or registered e-rickshaw association. This scheme allows plying of e-rickshaws in NCT of Delhi after compiling with mentioned conditions are the same. This scheme also includes permit conditions.
  - **Subsidy Scheme:** Government of Delhi launched subsidy scheme. It provides Rs. 15,000 subsidy to owners of e-rickshaw whose vehicle are purchased before 2016 and Rs. 30000 for e-rickshaws purchased after 2016. Rs. 6,000 subsidy is provided by the Delhi Pollution Control Committee.
  - **Domestic Charging:** Delhi government stated that domestic charging of e-rickshaws is legal and the drivers can charge their rickshaws at home. Separate tariff category has been created for charging station for e-rickshaws with a flat rate of Rs. 5.50/KWh.
  - **Delhi Electric Vehicle Policy:** Government of Delhi approved 'Delhi Electric Vehicles policy', the primary objective of the policy was to reduce the emissions from transport sector through rapid adoption of battery vehicles (BEVs) and further contributing to 25 % of new vehicle registrations by 2023.
  - **Charging Stations:** Ministry of Power and Government of Delhi approved the plan for setting up 131 new EV charging stations (33 EV chargers at metro stations, 34 at CNG filling stations and 48 at Oil filling stations outlets).
- **Telangana E-rickshaw Policy:** Telangana electric vehicle policy was introduced and the objective is to achieve 100 % shift to EVs by 2030 in their state, and is supported by infrastructure and local manufacturing base for EVs and its components. This includes permission of e-rickshaws to operate in fringe areas, retrofitting rule for existing vehicles and permission for corporate ownership of manufacturing industries.

### 2.4 Vehicle Registration Process of E-rickshaw

The following method are the currently practiced for the E-rickshaw registration process at RTO office are explained and stage-wise (Fig. 1).

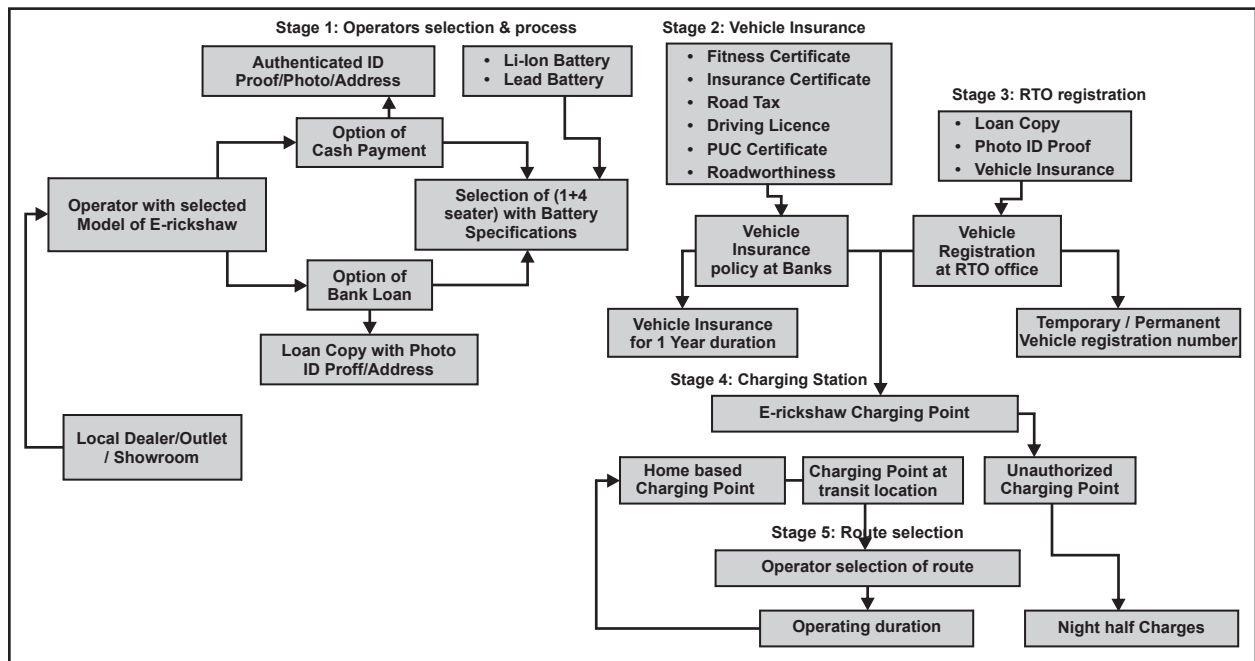
- **Stage-1: Operators Selection and Process:** In the very first stage, the operator selects the E-rickshaw with certain specifications, which includes the battery. The operator has 2 options for the payment mode for the purchase with valid identifications.
- **Stage-2: Vehicle Insurance:** Dealer provides the documents at the time of purchasing for vehicle fitness certificate, purchase copy and other relevant documents. The vehicle insurance is valid for 1 year duration with coverage in case of damages or an accident, etc.





- **Stage-3: RTO Registration System:** The process starts at RTO office, as the E-rickshaw is registered in the separate category. The operator is then digitally signed with submitting valid proof including the driving licence, vehicle insurance certificate and others. The vehicle gets temporary registered number plate and after one week of duration a permanent vehicle registration number in green plate is provided.
- **Stage-4: Charging Station:** E-rickshaw operator has choice for charging point at home-base, transit location or unauthorized charging point. The operator choice makes them to avail the difference in the charging tariff system. At unauthorized charging point, the operator is imposed with night halt charges with parking space.
- **Stage-5: Route Selection:** In the final stage, the operator will select the most demanded route with his physical observations. After the operational services, the E-rickshaw will go back to the type of charging point.

Fig. 1: Stages of Vehicle Registration Process of E-Rickshaw



### 3. TYPES OF E-VEHICLES CHARGING STATIONS

Charging of EVs is one of the major obstacles in the proliferation of these vehicles. As shown in Table 1 the various business models for EV charging stations are functional across the world are as under:

**Home Charging:** This is the most natural and convenient method. There are many benefits of home charging that ought to make it the most popular option. It eliminates waiting in lines, it is economical as you don't have to pay any middle man.

**Battery Swap Stations:** Battery swap stations are a concept often associated with better place, an EV infrastructure company. The idea is that when a vehicle needs energy, it can drive into a charging station and depleted battery is replaced manually by one that has a full charge. The main benefit associated with the swapping model is its speed.

**Public Charging Stations:** It gives the convenience of charging our vehicle, when we are away from our home or vehicle need charging at outstation location. Types of Charging stations available are given in Table - 1

**Table 1: Models of EV Charging Stations**

Public Charging Station: Level-I	Public Charging Station: Level-II	DC Fast Charging/Level-III
<ul style="list-style-type: none"> <li>It comes under slow charging category</li> </ul>	<ul style="list-style-type: none"> <li>It comes under medium charging category.</li> </ul>	<ul style="list-style-type: none"> <li>The fastest type of charging currently available.</li> </ul>
<ul style="list-style-type: none"> <li>It takes about 8 to 10 hours to completely charge the EVs.</li> </ul>	<ul style="list-style-type: none"> <li>It takes about 3 to 4 hours to completely charge the EVs.</li> </ul>	<ul style="list-style-type: none"> <li>The charging units are very expensive and require more power.</li> </ul>
<ul style="list-style-type: none"> <li>These are mainly available at the offices, residence or longer duration place</li> </ul>	<ul style="list-style-type: none"> <li>These charging stations are the most popular means of charging worldwide. Such charging units are available at the business centres/ shopping areas.</li> </ul>	<ul style="list-style-type: none"> <li>It takes around 30 to 45 minutes.</li> </ul>
<ul style="list-style-type: none"> <li>The life of the batteries is high.</li> </ul>	<ul style="list-style-type: none"> <li>The life of the batteries is comparatively high.</li> </ul>	<ul style="list-style-type: none"> <li>The life of the battery is widely affected by the speed of the charging.</li> </ul>

One of the major drawbacks of these charging stations is speed at which the batteries are charged. Most charging points available today, take very long time to recharge the batteries. To completely recharge the batteries, it takes around 6 to 8 hours. Technological advancement is still in its evolving phase as far as charging infrastructure of EV's is concerned and there are very few charging models that are running successfully.

#### 4. COMPARISON WITH SIMILAR MODES OF TRANSPORT

The comparison of the various models of transport is given in Table - 2. In our quest to find out the reason behind rapid proliferation of E-rickshaw in such a short span of time, are:

- Low initial cost of E-rickshaw;
- No registration of the vehicle is required; and
- Comparable income with that of auto-rickshaws.

##### 4.1 SWOT Analysis on E-Rickshaw

**Strengths of E-rickshaw:** The advantages of E-rickshaw are vast like



Table 2: Various Models of Rickshaws

Parameters	E-rickshaw	Auto Rickshaw	Cycle Rickshaw
Cost	80,000-1,10,000	2,50,000	15,000-30,000
Eating Capacity	4+1	3+1	2+1
Registration Process	Registration is mandatory under Motor Vehicle Act	Auto rickshaw comes under the Motor Vehicle Act, 1988	No Registration is required
Fare Collections	Charge Rs 10 for a distance between 2 to 5 km	Rs 25 for first 2 km, Rs 8 for extra addition km	Charges Rs 20 for 1 to 2 km
Speed	Most of these vehicles travel at a speed between 20 to 35 kmph	Maximum speed of 60-70 kmph	Limited speed less than 20 kmph.
Maximum Distance travel per day	80-100 km/day	230-280 km/day	15-25 km/day
Charging Time	6-8 hours	-	-
Electricity Consumed	6-7 units		

- E-rickshaw vehicles are environment friendly and are zero emission vehicles;
- Considering the distance travelled by an E-Rickshaw in a single day to be 70 km, these vehicles reduce CO2 emission by 164396 tones annually;
- These vehicles provide last mile connectivity from residential colonies to main roads, which are not well connected by other modes of transport;
- These vehicles are easily available and are more economical compared to auto-rickshaws and cycle-rickshaws for short distance trips;
- These vehicles are large scale employment generator for unskilled and semi-skilled people. Presently subsistence of more than one lakh family is presumed to depend on E-rickshaw; and
- Zero emissions and pleasant drive with no noise;

#### Weakness of E-rickshaw

- These vehicles are neither in motorized vehicle category nor in non-motorized vehicle category thus there is no rules and regulation;
- Some vehicles are not registered and don't have any number plates;
- Unskilled operators, which led to unruly driving and traffic congestion;
- Substandard components are used to assemble E-rickshaw, which put the life of driver, commuter and bystanders at risk;
- These E-rickshaws are charged at the owner's premises with domestic connection (tariff);
- There are also incidents of electricity theft and overloading of distribution transformers;



- No regulatory norms and laws to govern this market; and
- No proper safety parameters used in construction of E-rickshaw.

### **Opportunity with E-rickshaw**

- Alternative source of fuel like renewable and reduced dependence on fossil fuels;
- Helps in building future EV market;
- Reliable mode and cheaper for commuters;
- Lack of Charging Infrastructure; and
- Replacement of batteries are expensive;

### **Threats with E-rickshaw**

- Most effect is traffic congestion;
- Adverse effect on distribution connections;
- No data on number of E-rickshaw sold or in operational;
- Lead acid battery disposal will be a very big problem; and
- Disposal of used batteries is a threat to environment.

## **4.2 Scenario and Policy Recommendations**

India's EV market still being native, infrastructure development might take some time to grow. The E-Rickshaw still use the lead acid batteries and according to the study conducted by the battery council international fast charging is not applicable for these batteries. In this case of Li-Battery, the E-rickshaw have to be changed to Li-Battery run vehicles and Level - II, and fast charging infrastructure can be developed. For India to grow in the EV sector, it should first have certain rules and regulations, policies that guide the E-rickshaw. So, a certain policy recommendation is given based on the existing E-rickshaw market and future trends of EVs:

- These vehicles should be registered under Motor Vehicle Act with separated category;
- Driving license should be made mandatory for drivers of E-rickshaw;
- A time frame should be provided in the policy to complete the vehicle registrations, which are not registered till date;
- Commuters can also claim insurance, when the vehicle is registered in case of a mishap;
- Initiate public charging infrastructure at places, where E-rickshaw concentrations are high;



- Encourage usage of Lithium-ion batteries as there is no heavy metal content and also leads to opening up of the EV market;
- Subsidies for the Lithium batteries may be provided; and
- Battery manufacturers must be responsible for the recycling of the lead acid batteries and the recycling process should be certified because even a small quantity of lead can affect the ecosystem for a long time.

## 5. CONCLUSIONS

Initially it was said that E-rickshaw run on electric motors, which are rated at less than 250W and run at speeds not more than 25km/h.

- E-rickshaw market has to be encouraged as this market is the stepping stone towards the development of environment friendly market segment;
- Promote the use of public charging stations as the proliferation of E-rickshaw is going to be in very large numbers, so that the effects on DISCOM and power quality can be minimized;
- Promote the usage of Lithium-ion batteries by changing the necessary design parameters in the E-rickshaw to mitigate the environmental effects of lead acid batteries; and
- Infrastructure development has to be in accordance with the present technology, at the same time the future market prospects should also be taken into consideration. DISCOM and transport authorities should work in tandem for developing a well-established charging infrastructure.

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# Post Pandemic Approach to Urban Planning

**Sumita Gupta Gangopadhyay and Janmejy Gupta**

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## Abstract

*With the advent of COVID-19 pandemic globally, human beings are compelled to live differently. For mere survival, they have learnt to limit and control themselves. In India, the devastating effect of COVID-19 is felt mainly in the metropolitan cities, which are moving towards un-sustainability. One of the cornerstones of a sustainable society is elimination of waste flow at the source. Food packaging costs a lot and creates a lot of solid waste. Reduce, reuse, recycle, rejuvenate and rehabilitate is the way forward for making the society more sustainable. The scope of the paper is to control and limit the adverse environmental impact by reducing food miles. In the agricultural sector the scope of one such control lies in the area of food miles. Food miles, directly and indirectly affect the decline in air quality. Policy makers and planners should focus on what should be done to reduce these impacts of long distance food transportation vis-à-vis its impact on the environment.*

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## 1. INTRODUCTION

In the wake of COVID-19 pandemic globally, human beings are compelled to live differently. For mere survival, they have learnt to limit and control themselves. In India, the devastating effect of COVID-19 is felt mainly in the metropolitan cities, which are moving towards un-sustainability. One of the cornerstones of a sustainable society is elimination of waste flow at the source. Food packaging costs a lot and creates a lot of solid waste. Reduce, reuse, recycle, rejuvenate and rehabilitate is the way forward for making the society more sustainable. Among these, reduction and recycling of waste is particularly relevant for this article. Recycling of scrap aluminum, iron, glass, paper, etc., reduces air-pollution drastically. Restructuring of manufacturing process by producing aluminum and iron from scrap and not from the ore, similarly glass and paper from scrap are to be produced by the said alternative process.

Similarly, recycling of vegetable waste produces organic manure. Every household and public / semi-public building in cities should cooperate in making organic manure be it kitchen waste or yard waste. Biological composting is a way forward which is a lost art in many communities. Organic composting needs revival which will reduce garbage flow at the source. More urban farmers and gardeners will

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have a rich source of humus. Similarly, sewage water treated by sunlight and water hyacinth, in the traditional way can produce water for irrigation purpose in cities which will in turn help urban agriculture. Further, rain water harvesting reduces water scarcity in cities.

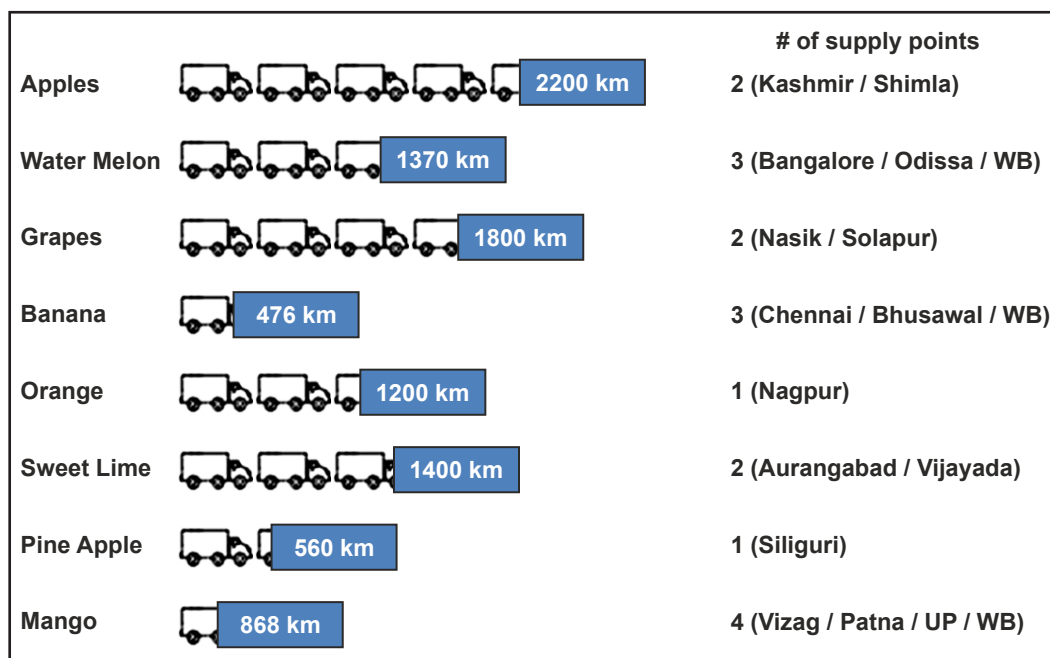
The scope of the paper is to control and limit the adverse environmental impact by reducing food miles. In the agricultural sector the scope of one such control lies in the area of food miles. Food miles, directly and indirectly affect the decline in air quality. Approximately, 30% of all goods transported by trucks in India comprise of foodstuff.

'Food Miles' refer to the distance food is transported from the place of production (farm) to the point of consumption (plate). The concept of food miles is a comparatively recent phenomenon, originating in the early 1990s. It was conceived by Prof. Tim Lang of the Sustainable Agriculture, Food and Environment Alliance in the U.K. Later Angela Paxton documented it in her report 'Food Miles Report: The Dangers of Long Distance Food Transport'. The World Food Summit of 1996 describes food security as that which exists when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life. However, it completely missed the point regarding sourcing such food through sustainable means. At a time when we ought to be making cuts in the greenhouse gas emissions, it proposed for existing food system to extend its supply chains and thereby led to increase in emissions to a point where it ended up as the single largest contributor to global warming. Ironically, global warming caused by industrial food supply system led to disruption of the predictable climactic cycles on which agriculture depends. This in turn led to reduced food production and caused serious threat to food security in 2007-2008. It is a vicious cycle and energy use is still the key cog in that cycle. Not only is the contemporary food system inherently unsustainable, it is also severely damaging the environment. Therefore, it makes little sense to leave out the sustainability component in any dialogue on the food production and supply systems of the future. (Source: <https://wowad.in/chapter-2-the-road-to-self-sufficiency-in-food-production/>)

## 2. CONCEPT OF FOOD MILES IN CONTEXT TO ENVIRONMENTAL POLLUTION

With the passage of time, with increasing globalization of trade, food tends to travel a greater distance from farm to plate - this is especially relevant for industrialized and advanced countries. In United States, for example, it is estimated that processed food travels 2,080 km (1,300 miles) and fresh produce 2,400 km (1,500 miles) before it reaches the consumer. In the UK 95% of fruits and half of the vegetables come from abroad. Here 30% of all goods transported by trucks are foodstuff (Stratford, Helena; 2016, Food Miles: The Environmental Impact of Food- [www.pollutionissues.co.uk](http://www.pollutionissues.co.uk)). Consumers in the U.K. get their

**Fig. 1: Average Distance by Truck to Kolkata Terminal Market (Mechua) for Selected Fruits.**



Source: Each truck represents 500 km. (Case of the Food Miles Footprint by Rahul Gupta and Sumita Gupta Gangopadhyay, pg 55, Farmers' Forum, Vol 16, No 03, June July 2016)

oranges from California (5,000 miles), bananas from West Indies (4,000 miles), beef from Argentina (7,000 miles), tomatoes from Spain (1,000 miles), cocoa beans from Central Africa (3,000 miles) and lamb from New Zealand (11,000 miles). These long distance trades in food result in various environmental, social and economic costs. More the movement (be it by road, air, train or ship), higher is the emission through burning of fossil fuels, thus adding to the greenhouse gases (GHG), leading to global warming. In the Indian scenario, a look at the distance travelled by commonly consumed fruits like watermelon, apples, orange, grape, banana, sweet lime, mango and pineapple to Mechua whole sale fruit market, in Kolkata, will suggest the magnitude of carbon di oxide emission. This will give an idea about carbon di oxide emission of Indian metropolitan cities from only one food item (fruits). The Kolkata data is given below in Figure 1 and Table 1.

From Table 1 we find that 4,997,287 liters of diesel is burnt to transport fruits to Mechua wholesale market Kolkata. This translates to 13,402.8 tones per year of carbon-dioxide emission. Total diesel consumption by trucks in India (21% of 69 million tones) is about 14.5 million tones or 17,060 million liters, which causes a carbon dioxide emission of 45,755,100 tones annually. Fruit trucks only to Mechua wholesale market in KMC accounts for 0.03% of carbon dioxide emission



**Table 1: Distance Covered and Diesel Consumed for Transporting Selected Fruits to Kolkata.**

S. No	Fruit (Source)	Quantity Tones/ year	Number of Trips (14 mt/ truck)	WASD* (km)	Distance covered per year (km)	Litres of diesel burnt @ 3 km / litre
1	Apple (Kashmir / Shimla)	36960	2640	2200	5808000	1936000
2	Water Melon (Bangalore/ Bhubaneswar / WB)	7600	633	1370	867210	289070
3	Grapes (Nasik / Solapur)	13860	990	1800	1782000	594000
4	Orange (Nagpur)	13200	1100	1200	1320000	440000
5	Sweet Lime (Aurangabad / Vijaywada)	25344	2112	1413	2984256	994752
6	Banana (Chennai / Bhusawal / WB)	36000	3000	476	1428000	476000
7	Pineapple (Siliguri)	1200	120 (10 tonne trucks)	560	67200	22400
8	Mango (WB-Malda / Vizag / Patna / Lucknow)	11860	847	868	735196	245065
9	Total	146024	11442		14991862	4997287

Source: Above data is based on primary survey of wholesalers/ transporters in Mechua Wholesale Market By the author

Note:1. Food-miles as per wholesalers/ transporters in Mechua Wholesale Marke, Kolkata.

2. It is estimated that 22.38 lbs or 10.138 kg of carbon dioxide is emitted by burning 1 gallon (US) or 3.78 liters of diesel (Source: www.eia.gov- Independent Statistics and Analysis; US Energy Information Administration).

\*Measurement of food miles is done computing the weighted average source distance (WASD), the formula for which is:

$$\frac{\sum\{m(k) \times d(k)\}}{\sum m(k)}$$

$$WASD = \frac{\sum\{m(k) \times d(k)\}}{\sum m(k)}$$

$$\sum m(k)$$

Where,  $m$  = quantity consumed from each location of consumption origin

$K$  = different locations of production origin

$d$  = distances from the locations production origin to the point of consumption

by all trucks in India. Mechua is just one market in one metropolis. If we sum up entire fruit transportation across the country, the contribution towards carbon footprint will be substantial.

Globally, 30% of the world's available energy is consumed by the agri - food chain. Out of this, 70% is consumed beyond the farm gates. The agri - food chain is also responsible for 20% of the world's GHG emission. It is not that all the energy consumed by the agri-food chain is gainfully utilized, as one third of the food produced is wasted and along with that about 38% of the energy that we consume (Energy-Smart Food at FAO: An Overview, FAO, 2012). 83% of the GHG emission

of the agri-food chain comes from the production and processing activities, while 11% comes from transportation and about 5% from retailing / wholesaling activities. Out of the total carbon footprint attributed to food transportation, road transportation accounts for 60% whereas air, sea and rail transportation accounts for 20%, 10% and 10% respectively (Source: Food Miles-A Green Wash, Indian Carbon Outlook.com/content, January 2011). Though air transportation is responsible for 50 times more emission than sea transportation, the sheer volume of road transportation (for food) makes it the highest contributor in green house gas emission. The bulk of fresh food (namely fruits and vegetables) transportation within India is done by the road transport mode with a small fraction using the railroad.

A look at the increase in energy consumption in the different source components over the last 15 years will give an idea of the magnitude of polluting sources (namely fossil fuels) in the near future, (Table 2).

**Table 2: Energy Consumption Increase from 2005 to 2020.**

Consumption	2005 consumption (mill TOE)	2020 consumption (mill TOE)	Gain or Loss (mill TOE)	Percentage change
<b>TOTAL (sum of components below)</b>	<b>11,409</b>	<b>15,544</b>	<b>4,135</b>	<b>36.2</b>
Oil	3678	4300	622	16.9
Natural gas	2420	3600	1180	48.8
Coal (conventional)	2778	3193	415	14.9
Traditional biomass and waste	793	1400	607	76.5
Nuclear fission	624	790	166	26.6
Hydro	624	790	116	18.3
Other biomass, Methanol, Ethanol	370	388	18	4.9
Unconventional oil from tar sands and shale	88	350	262	297.7
Coal Processes total from liquefaction, oxygenation, gasification	-	500	-	-
Solar (Photovoltaic, solar power towers, solar thermal ,and space solar)	11	100	89	809.1
Wind	8.5	100	92	1076.5
Nuclear fusion	0	0	0	-
Methane gas hydrates	0	22	22	-
Geothermal	4.8	50	45	941.7
Tides	1	1	1	900

Source: *The millineum project. (2011). Retrieved from works: <http://107.22.164.43/millennium/scenarios/energy-scenarios.html> (available online)*



Based on data from the International Energy Agency, (Table 2) world's energy needs is estimated to be 50% higher in 2020 than they were in 2005. Yet, the fossil fuels, on which the world still depends, are finite and far from environment friendly. Serious thought needs to be given now to creating viable alternatives.

### **3. SOLUTIONS TO THE PROBLEMS ARISING OUT OF FOOD MILE AND ASSOCIATED ENVIRONMENTAL DAMAGES**

Based on the above discussion, potential ways to control food miles and ensuing environmental impact are as follows:

- Promotion of urban agriculture or locally grown food;
- Enactment of legislation;
- Implementation of Zero waste policy; and
- Rethinking of transportation modes.

Among the above options we will focus on locally grown food or urban agriculture as that is most viable in the present scenario. Producing vegetables, fruits, poultry and fish locally and practising urban agriculture (UA) will help limiting food miles. Additionally, buying locally grown seasonal variety of vegetables fruits and perishable items can drastically cut food miles that we consume.

#### **3.1 Practice Urban Agriculture (UA)**

UA is “an industry located within a town, a city or metropolis, which grows or raises, processes and distributes a diversity of food products (re)using largely human and material resources, products and services found in and around that urban area, in turn supplying human and material-resources, products and services largely to that urban area” (Mougeot 2000). Urban agriculture can be sub-divided into two broad categories:

- Urban agriculture dependent on waste and waste water recycling within the city limit and fringe; and
- Growing useful trees and seasonal vegetables locally.

In short UA includes various types of farming systems such as orchards, vegetable production, horticulture, floriculture, livestock raising and urban agro-forestry on the city fringe. UA has the potential for providing much higher benefits in nutrition improvement, income generation, enterprise development, pollution control, environmental enhancement and reduction of carbon footprint as locally grown agricultural products are available through land management and waste recycling potential. The growing awareness for the protection of environment through preservation of wetland/ forest and agricultural cover has brought new dimension to urban agriculture. Perhaps, the most underrated role of UA is in revitalizing the city soil. The constant



leaching of the city is in revitalizing the city soil. The constant leaching of the city soil has eroded away much of its fertility. Even the leaves which fall on streets and ground are collected and hauled away by the municipal authority. The practise can be replaced by the production of organic manure or composting.

UA can be practised on:

- Private and public vacant land in and around cities;
- Slopes, wetland, low lying urban areas, unbuildable land etc.;
- Along the sides of roads, canals, rivers and coastal bay;
- Backyards, roof tops, vacant lots and community gardens;
- Peripheral land around institutional buildings like schools, prisons, hospitals etc.;
- Suburban farms and garbage landfills;
- Sewage lagoons; Urban agro-forestry, green verge and parks; and
- Land reserved for future urban development such as land reserved for township, industry, hospitals, schools etc.

### 3.2 Grow Local and Seasonally

By choosing locally grown produce, you can drastically cut the food miles that you consume. Additionally, buying produce that is in season increases the chances that it is grown closer to home. Long distance food environmentally damage directly due to transport emission, transportation adversely affects the way food is grown and treated to withstand the rigors of transit. The impact of transport dependent food system on environment (through increased carbon foot prints), health (through chemically heated food with pesticide for longer preservation) and preservation of greenery (through increased use of paper board packaging material for protection of delicate fruits and vegetables in long transit) is a serious issue which merits reformative measures in existing practices been employed. How far food travels have serious implications on health and climate. In addition to reducing food mileage by purchasing locally grown produce, quality of the fruits and vegetables purchased locally improves. Reducing one's food mileage consumption, even by a little bit, can have a large impact on the environment. If everyone chose to purchase locally grown food instead of imported food, there would be a significant drop in greenhouse gasses emitted and overall oil consumption due to food transportation. Even a small change can help the environment.

### 3.3 Legislative Interventions

Under pressure from industry lobbying the national government has not introduced a carbon tax on CO<sub>2</sub> producers. That measure alone would begin to



reduce food miles. It may be incorporated through legislative measures to make it mandatory for public/semi-public buildings/institutional buildings to practice urban-agriculture as these buildings are usually placed on large sized sites in India wherein growing fruit trees is a feasible solution vis-a-vis providing landscaping solutions as well.

### 3.4 Recycling

Recycling of scrap aluminium, iron, glass and paper reduces air pollution remarkably. Restructuring of manufacturing process by producing aluminium and iron from scrap and not from the mines, similarly glass and paper from scrap are to be produced by recycling. Recycling has a very important role to play, be it organic waste, sewage water, rain water, scrap-material and garbage in limiting food miles and reducing carbon foot print.

### 3.5 Re-think about Transport Methods

It is not just the distance that a foodstuff travels that impact upon its food miles; it is also the method of transportation. As a general rule, one should try to limit consumption of foods that have been transported by air the most, as these are typically moved in this way as they perish quickly and have to get from producer to market as soon as possible. Long truck journeys are also significant additions to food miles as they use a lot of resources to move comparatively little product. Sea travel is arguably the most efficient and 'green' form of food transportation, as a lot of goods can be transported in one go, making for smaller carbon expenditure. However, this is a guideline only, as the transportation methods may be offset by the energy costs of the product's production. Inter-city and intra-city waterways linkages utilizing the main rivers of India and canals may be introduced at least for freight movement following similar water transportation methods as followed in Bangkok, Thailand and other countries globally. A futuristic method of food supply and cargo movement can be solar powered trains. Solar powered trains can be put in motion by placing photovoltaic panels close to or on to rail lines. They can generate enough electricity to trigger a traction current that will be distributed to the grid. India is already a pioneer in solar powered passenger movement and it can be further explored.

## 4. CONCLUSIONS

Policy makers and planners should focus on what should be done to reduce these impacts of long distance food transportation vis-à-vis its impact on the environment. Long-distance, large-scale transportation of food consumes large quantities of fossil fuels. It is estimated that we currently put almost 10 kcal of fossil fuel energy into our food system for every 1 kcal of energy we get as food. Transporting food over long distances also generates great quantities of carbon dioxide emissions. Some forms of transport are more polluting than others. Airfreight generates 50 times more CO<sub>2</sub> than sea shipping.



But sea shipping is slow, and in our increasing demand for fresh food, food is increasingly being shipped by faster—and more polluting—means. In order to transport food long distances, much of it is picked while still unripe and then gassed to “ripen” it after transport, or it is highly processed in factories using preservatives, irradiation, and other means to keep it stable for transport and sale. By emitting nitrous oxides and particulates, transportation causes air pollution. Air pollution is considered to be the most dangerous environmental threat caused by transportation. Highway vehicles, marine engines, trains and planes are the main causes of pollution which affects air quality causing damage to human health. All these toxic air pollutant are closely related with the cause of cancer, cardiovascular (heart arteries, capillaries and veins), respiratory and neurological diseases.

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