

INVESTIGATION OF TOD-NESS OF SMALL AND MEDIUM TOWNS IN SRI LANKA

G.V.T.P. Wanigasekara, P.K.S. Mahanama, A.B. Jayasinghe

Department of Town and Country Planning, University of Moratuwa, Moratuwa 10400, Sri Lanka

therusha.piyumantha@gmail.com, mahanama@uom.lk, amilabj@uom.lk

ABSTRACT - Transit Oriented Development (TOD) has been a promising planning concept which strengthen the land use and transport integration for a sustainable development. As per the concept benefits of TOD are manifold but it may differ for each stakeholder in planning. However, several studies related TOD concept further reveal that there is lacking part in spatially evaluation process of TOD concept. Addition to that there is no generally accepted process for or set of study and identify the pattern of TOD ness. This issue directly impacts on planners, decision makers and practitioners while getting the perception of existing physical and functional conditions of areas which they are planning to develop, upgrade or maintain. In the way of decision-making process in planning to encourage transit-oriented development(s) in a place, it is essential terminology to have a well direct analytical process to study the current status of TOD ness with related factors at a location and in an area. By based on several frameworks there are several studies have done in global context. But there is nothing can identify any related study for investigating TOD ness in Sri Lanka city background.

Keywords: transit-oriented development; TOD-ness; compactness level; potential TOD index; urban maturation

1. INTRODUCTION

Transit Oriented Development (TOD) has been emphasized as a planning approach which objects to integrate land use and transport planning, Schlossberg & Brown (2008). However, there are many explanations of TOD proposed by Calthorpe (2005), Brown, Schlossberg (2008), Boarnet and Crane (2004), Parker et al. (2006), Cerverno (2007), Poticha, Dittmar (2007) and many others, the common objective of planning TOD convince to encourage people to walk, cycle and use public transit modes, as structure wise moderate densities to high densities and prioritized walkable environment. TOD ness is multi-dimensional phenomenon that it is important to be study the TOD ness and identify its factor behavior at transit locations. Since TOD's prior objective may change based on different stakeholders' perception. Due to unavailability of study regards to identify TOD ness in small and medium towns in Sri Lanka, through this study expect to reach that need by investigating TOD ness of selected small and medium towns in Sri Lanka. Basically, the study concern on factors such as built-up-density, land use diversity and accessibility.

2. MATERIALS AND METHODS

According to the study, method of study explains overall process of study and further data collection & execution for selected study areas based on 5km buffer radius & along 5km main road, to study TOD ness, to understand the factor behavior in each context and then to derive potential TOD index. Initially data were processed under five main indicators such as built-up density, Accessibility (closeness centrality-local integration) (closeness centrality-global integration) land use diversity (Entropy Index). When compare with other factors prevailing in the research domain here selected factors has selected based on overall spatial configuration level in selected case study areas.

3. RESULTS AND DISCUSSION

Initial explain based on results derived from four main indicators and then after the combined each variable

in each study area and then study TOD ness in each case study areas respectively. Then identify the pattern of each variable within the 100m-by-100m buffer distance. Parallel to that another study explains of the how Difference the TOD characters along the main road which begins from major TOD node (bus Terminal). How factors behavior can be changed parallel to that. In the end, discuss in detailed relationship among those variables in each case study area.

3.1. Study TOD-ness of each case study area by factor

3.1.1. Built-Up Density

Kandy, Badulla, Galle, Kurunegala and Anuradhapura has high to low built-up density respectively. From 600m distance to away instead of Anuradhapura rest of the case areas built up density showing decreasing trend. According to finding of study, study show high value trend from TOD node (bus terminal) to 500m distance area. Density value has to be show continuous low value until the 5000m distance. Along main road within 100m distance highly densified with the built-up cover.

3.1.2. Closeness Centrality-local Integration

Accessibility was measured by the closeness centrality. Closeness centrality (LI), two out of five study areas have the high walkable connectivity within the bus terminal to 300m distance. Findings show, within the 1000m buffer distance Kandy has 65.72% percentage of closeness centrality by reporting high walkable connectivity level. Close proximity surround TOD node in Kandy indicates the highest walkable connectivity level. Then Galle, Anuradhapura, Badulla and Kurunegala were shown high to low local integration value within their close proximity to the TOD node respectively. Further Kandy main road resulted continuous highest walkable connectivity. Next to Kandy then Galle, Kurunegala, Badulla and Anuradhapura has resulted walkable connectivity from high to low level respectively.

3.1.3. Closeness Centrality-Global Integration

High vehicular connectivity level can be identified within 1000m radius from transit node. As an overall comparison Anuradhapura has high volume of global integration & Galle, Badulla, Kurunegala and Kandy has resulted respective integration. Findings of the CC (GI) level based on the selected main road which is started from TOD node (bus terminal) as an overall output, every case study has high connectivity level (GI) near to the TOD node (bus terminal).

3.1.4. Land Use Diversity

Each area was resulted positive trend of high land use diversity surround the TOD node. As an overall percentage 90% of the land use mixedness has been accumulated within the first 1000m radius in all five case study areas. As per the findings, Kandy has resulted highest trend value for land use diversity within 100m close proximity from TOD node.

3.2. Define TOD ness with Urban Compactness level (Clark model)

When investigate pattern of TOD ness, which can be defined with the use of Clark model. Urban compactness is a function of density, land use diversity and travel proximity (Gordon & Richardson, 1997). Actually, when study the pattern of TOD ness, study the compactness level is more effective to determine the influence of each indicator to the study area. While investigate the TOD ness of the case study areas, investigating the urban compactness level has been paid more positive approach for the study. Actually, urban compactness assessment has two different approaches. That is physical compactness and functional compactness. Functional measures which can be used as quantifying tool for studying the pattern of functional character of the study area. Although, Study of the compactness level it may interpret better conversion of TOD ness & factor behavior of each study area.

3.3. Potential TOD Index

In potential index as a dimensionless figure that replicates the degree of orientation of development towards

transit is relative in nature and its interpretation requires an interactive process, however, there is no established scaling system to classify resulting index values directly, so below index maps has resulted that potential surface of TOD ness by giving respective weighted assignment for each rasterized criteria's and finally reflect potential TOD index value with visual spatial pattern of TOD-ness across the five case study areas based on transit terminal & surround factors.

Here potential TOD index value has been generated with applying respective weighted assignment based on the rasterized criteria's validity. Weight assignment has been done within 0-100% range. LU diversity, accessibility (CC LI & CC GI), built-up density has been weighted respectively & finally potential TOD index generated as overall Weighted sum. According to the overall factor behavior reveal LU diversity factor would have more important in whether deciding TOD ness in TOD planning.

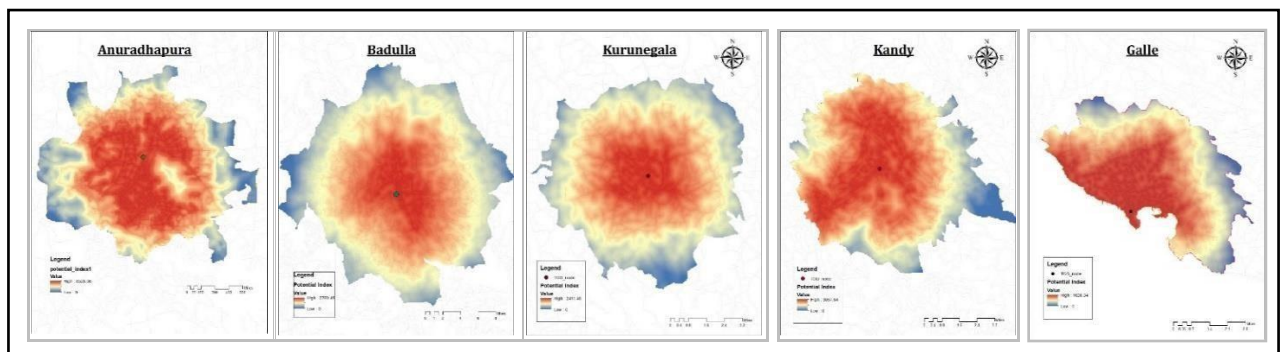


Figure 1-Potential TOD Index Maps

4. CONCLUSION

The diverse results of this study reveal that quantitative approach to study TOD ness in five selected case study areas, with four selected factors. (Built up Density, Closeness centrality (LI), Closeness centrality (GI) and Land use diversity. Here study has done based on main transit terminal in each case area. From that TOD node, study area has divided under 100m buffer distances within 5km area. Even though, four initial indicators quantitatively studied factor behavior within respective buffer distances. Also taking main road of the study area, another study has done with respective indicators. Then considering respective results, given weight assignment to each variable and composite for generating final potential TOD index. The study successfully describes in term concerning mathematical relationship between factors. Further fractal analysis indicates the relationship between urban maturation process and TOD ness. Since overall study about TOD ness with the interaction of transit terminal and identification the factor behavior of TOD ness is important for TOD planning and can be considered as an approach for planning decision making process.

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