

The TOD Suitability Index: A Planning Framework for Transit-Oriented Developments (TOD)

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Abstract: Cities are becoming more and more crowded, but they remain as the commercial and business centers. Therefore, developers are continuing to create new urban developments to cater for growing population of cities, however, they usually lack mixed-use opportunities for new residents to work and do business, so constant travel to the main city center is needed. The lack of proper access to public transportation to these areas increases the need for automobile infrastructure to support its continued growth. A transit-oriented development (TOD) integrates various land uses around transit areas for economic growth and pleasurable travel experience, while protecting and conserving the environment. TODs for urban developments will increase integrated green spaces, green infrastructure development, and better connectivity between urban developments. The study elaborates on a tool (The TOD-Suitability Index (TSI)) that empowers planners, decision makers, and designers that integrate public transportation access, land-use planning and zoning, place-making, and green infrastructure, therefore improving quality of life and human well-being, better use of the public transportation system, improved streetscape, and public space conditions. Case studies were done in three scales of transit-areas (neighborhood, city, and regional). The case study areas have either a prominent residential area, commercial zone, or is a central business district that have access to multiple modes of public transportation. The results of the case studies showed that all areas failed because they scored low in Place Value and Market Potential even though they had average to high Node Value scores. Recommendations generated by the TSI provide basis for items that need to be developed to improve transit areas which allows the project prioritization, budget allocation, and comprehensive development plan integration.

Keywords: Transit-oriented developments, urban planning, public transportation, green space integration

1. INTRODUCTION

Megacities of the world such as Beijing, Delhi, and Metro Manila continue to expand and grow. Due to congestion, there is a tendency towards converting land-uses in urban and suburban communities. With population growth, the city produces more pollution emissions, solid wastes, and overcrowding sets in. In most megacities, the interconnection between its suburban and urban-centers focuses on the use of motorized vehicles, a primary contributor of atmospheric pollution. In the Philippines, Metro Manila's inefficient public transportation systems encourage people to buy their own vehicles to address the inconvenience of commuting. With improved mobility, developments outside the main city core are easily accessed by private vehicles, contributing to as the phenomenon called "urban sprawl".

The current population growth of Metro Manila shows no sign of slowing down as shown in statistics of in-migration towards the National Capital Region (NCR), Southern Tagalog

Region (CALABARZON (R-IVA)), and Central Luzon (R-III). One of the main reasons for this is job opportunity. People migrate from other provinces to locate in Metro Manila or near it (R-IVA and R-III). Since rent costs are higher inside the city, most immigrants live in nearby provinces and travel daily to the city to work. This generates a great volume of daily ridership that often leads to congestion in public transportation, as well as in a significant increase in private vehicle usage. This results in daily heavy traffic that causes inefficiency for business and discomfort and inconvenience to users. The continued in-migration also results in the proliferation of informal settlements that provide low-cost lodging for the immigrant working class.

According to a joint study by JICA and NEDA in 2014, if the traffic situation is not addressed, 2030 will be a traffic nightmare with most roads already at their maximum capacity. Nevertheless, population will continue to grow even without proper amenities like public open spaces, proper streetscapes, and connectivity. Public health decline will continue to be an issue and disaster risk also increases because of the lack of emergency spaces available for the city population. A proposed solution is to create growth centers in the nearby regions of Metro Manila. These growth centers will become central hubs, generating jobs, promoting local industry, and providing improved residential capacity. These hubs should be properly connected to other hubs to enhance and ensure trade and movement of users and investors as well as to provide better place-making and healthier spaces. Modernization of Metro Manila's transportation is also included in the solution, providing more mass transit options and better public transportation experience.

2. RATIONALE

The needs of the highly urbanized areas, such as transportation, developable spaces, and residential areas, will continue to increase because of the improving economy and developments centered in the metropolitan areas. The expected expansion of the urban and regional forms is very crucial in planning more sustainable and healthy cities, and their networks. The current methods of urban and regional planning in the Philippines are more focused on catering to vehicular accessibility over pedestrian use and effective open spaces. These lack provisions and concern for integrating economic and physical development with social, health and wellness needs of people, as well as cultural and ecological protection and conservation within metropolitan areas. Major cities in the Philippines suffer from huge traffic problems because of the residents' improved capacity to own and use private cars. The application of the transit-oriented development (TOD) concept to produce neighborhood developments as well as transit hubs that will reduce the dependence on private transportation and promote the usage of mass transit systems and active travel is proposed.

Transit-oriented development (TOD) is one of the tested approaches for mitigating urban sprawls and reducing private vehicle dependency. TODs are moderate to high-density developments located within an easy walk (distance might vary because of climactic conditions) to major public transportation stops. These are mixed-used developments designed for pedestrians and cyclists and discourage use of private vehicles. The main motivational pull of TODs is possible increase in land values, improved economic activities and affordable housing near transport hubs because of lesser travel costs and travel time to access public transport. TODs allow the commuting population to relocate to areas away from sources of employment but linked by reliable public transport. This will help decongest the urban core of its working population. Locating rail stations and other public transportation hubs

near suburban communities and other housing developments will increase transit ridership and moderate automobile travel by increasing regional accessibility to jobs and other economic activities. High-quality walking and cycling environments with mixed land uses in the vicinity of rail stations, through better and responsive urban designs, produce improved ridership statistics.

Absence of transport station area master planning leads to developments where no design and development standards are followed (overcrowded sidewalks and ill-designed stations). TODs, in a larger regional plan, are nodes that integrate other areas around them. Applying the TOD concept requires multiple factors to be assessed. In the World Bank Study by Salat and Ollivier in 2014, three values - node, place, and market potential, are identified that can be used in planning of TODs. This is called the 3V Approach where the different values provide a basis for research, planning, and formulating recommendations.

3. REVIEW OF RELATED LITERATURE

The review of related literature starts with how the TOD concept was first envisioned and used. This is then related to the concept of transportation and planning which are two key aspects in a TOD. Lastly, literature reviews of best practices and applications of a TOD that can be used as basis for this thesis' criteria and frameworks. An article by Harris and Ullman, first published in 1945, discusses the various forms (concentric, sectoral, and multi-nuclei) and evolutions that a city can undergo. These changes are influenced by various factors like services, goods and industry of the area, mode and access to transportation, development and possible expansion of the area, etc. This shows the need for planned development so that each subsequent development is tied to the next. Furthermore, the article by Carlton in 2007 discusses history and pitfalls of the TOD concept. This literature is useful because criteria can be derived from the mistakes (loss of community character, disjointed infill developments, and fragmented mixed-use developments) of previous developments that made TODs fall short of what was promised (better land values, improved quality of life, and increased user traffic). This has led to the need of a standard to determine the success and failure of a TOD and importance of a cohesive planning of initiatives in a TOD.

Transportation and connectedness is an essential part of planning a town or city as connection between needed service, income generation sources, and residents/users, wherein a thesis dissertation by Fyfield in 2003 found out that mode of transportation is one of the major factors that affected the land use and development pattern of Portland. Relating to mode of transportation, a study by Loo, Chen, and Chan in 2010 suggests that higher private car usage may increase because of safety and convenience as compared to using public transportation means like the bus. Variables affecting usage of TODs are land use, station characteristics, socio-economic and demographic characteristics. Inter-modal cooperation (improved public transportation link to train stations) policies should be taken into consideration to promote transit ridership and reduce automobile dependency. According to Johansson, et. Al. in 2017, this makes both, local transportation solutions like bike paths and pedestrianization connections to transport stops and regional transportation policies are equally important to an extent to users, developers, and investors. There is a common disjunct between the synchronization and planning of the two transportation scales. However, it is shown in the study the one cannot function properly with the other. A national railway, for example, cannot serve its users well when the transport stops near user destinations is inaccessible, poorly planned, and badly designed. The same situation also for a well-planned neighborhood TOD which has no access or connection to a higher level of transportation. This is supported by

Olaru, Smith, and Taplin in 2011, where they show the importance of developments near residential locations and the effect of the quality of these neighborhoods to the willingness of planners to locate transit stations there.

Public transportation is described as road-invested (public bus) and transit-invested (train systems). The complimenting the routes of both road-invested and transit-invested approaches help in traffic decongestion. Policies, as written by Lee, et. Al. in 2010, can be made to discourage private transportation by reducing the amount of parking spaces available for commercial establishments that are easily accessible by public transportation. Therefore, as the study by Fischer, Smith and Sykes in 2013 stipulates that the relationship between land use and transport planning is a multi-sectoral endeavor. For effective planning and implementation, there should be a clear and over-arching main goal that would encompass all work to be done. This would help all participating stakeholders and consultants involved become more cohesive in detailing and implementation of the masterplan. This means that the main goal and its supplementary objectives should be established and comprehensible. However, a study by Yao and Wang in 2014 discusses that there can be urban sprawl even with good public transportation and a mass transit system like a bus/subway system. Beijing is considered decentralized with residential zones. Higher income residents live in the downtown area close to all city amenities and work options. Suburban housing is in the outer regions of the city where they are serviced by streetcar and other public transportation means. The suburbanization amplified with the operation of rail systems, then, the rise of automobiles showed the need for road infrastructure. Most users do use public transportation, but they still go and work in the central city area resulting in congestion of the main city area because of the daily influx of people. The study indicates that it is not enough to provide better transportation options for people living in the suburban areas to reduce urban sprawl and automobile dependency. There must be new growth centers that will attract these residents to work nearby the suburban areas rather than go to the central city area. These growth centers should be able to provide job opportunities, socio-cultural and institutional amenities, and public open spaces.

The design of TODs consider numerous factors and a study by Tumlin and Millard-Ball in 2003 focuses of the three-Ds (3Ds), density, design, diversity, of achieving a successful TOD. Density deals with the concentration of users within the immediate vicinity of a transit station. Diversity deals with the users being not only encompassing residential areas or households, because it may also include work places, commercial areas, or institutional areas. Design includes the design of urban block sizes, street patterns, parking areas, streetscape, greenways and parkways, and other elements that would help add to the walkability of the whole development. While Clagett's study in 2014, the taking into consideration of mixed-income households is necessary in the development of a true TOD. TODs must address the needs of mixed-income households because the intended ridership does not only encompass a single income class. The connections that TODs provide reduce the effect of displacement of low-income populations and encourage a more transit-reliant approach to transportation rather than a heavily car-dependent one. O'Hare's study in 2017 discusses that TODs seek to develop compact neighborhoods with housing, parks, shops, offices, jobs, and civic and community facilities that are all accessible within a five-to-ten-minute direct walk to public transport stops. The urban design component can be incorporated in making the walk a better experience by promoting comfort and security. It also affects the permeability and the connectivity of the pedestrian routes. These are all summarized in a way by the book written by Salat and Ollivier in 2017, published by the World Bank, deals with many case studies and

researches on the benefits, effects, and proper planning of TODs. It primarily uses the 3V Approach to determine the effectiveness or needs of a TOD. The 3V stands for three value groups which are the Node, Place, and Market Potential. The Node Value is mainly concerned with the transportation and connectivity aspect of the TOD. The Place Value deals with the spirit of the place and the effect of design on the users. Lastly, the Market Potential Value considers the job, residential, and development potential of the area as a TOD. Case studies also show the planning process of successful TODs and these can be used for benchmarking the index that is being formulated for this study.

4. DESCRIPTION OF INDEX

The TOD Suitability Index (TSI) is a multi-criteria site analysis and assessment tool that considers three main values (Node, Place, and Market Potential). Other elements and criteria were also present, but they are already grouped together and merged to make the index more concise. The criteria, however, is not final and can be manipulated by the user to add or remove any applicable/inapplicable items. This allows the TSI to be reliable for standard usage and flexible for more varied site conditions. The TSI summarizes the analysis and assessment of TOD requirements into a user-friendly format for easier application of potential users. This opens more TOD type of planning to decision-making bodies in the LGUs and planning industry professionals. The Summary of Results and Recommendations is the final part of the TSI wherein each value group is given an assessment and recommendation. It guides the user in determining if the study area is suitable for a TOD. Given either result of pass or fail, the users are able to derive recommendations for the area to make it more conducive for a TOD. This can be used for both existing and future TODs study area and helps them in determining the priority items for development. Furthermore, in-depth specific studies would be needed to proceed further in the design process.

There were three study areas in terms of scale: Neighborhood scale, City scale, and Regional scale. The boundary of each scale category are as follows: (1) Neighborhood – the entire population of the neighborhood within the boundaries of the barangays that will be directly affected by the possible main transit hub. Main transit hubs can be an area or a collector road common to all barangays. (2) City – The 500-m radius around a current/possible major transport hub with modes of city-to-city transport will be the boundary of the study area for this scale. This covers the immediate area of the transport hub, including users' origins and destinations and modal transfer facilities. (3) Regional – The one-km radius around a current/possible major transport hub with modes of transport servicing inter-regional/provincial routes describes the boundary of the study area of this scale. This considers the immediate area of the transport hub that includes users' origins, destinations and modal transfers. Also included are further adjacent areas serviced by the hub.

The process and description of using the TSI is shown in the TSI Tool Kit shown below. The scale must first be determined. Then, a site inventory of the area must be done. A sample site inventory list is found here also that can serve as a guide to future users. Then, using the TSI Grading sheet which has various criteria for each value group. It is possible to determine if the area passes (50% and above) or fails (below 50%). Either result would lead to possible recommendations to make area more suited to be a TOD.

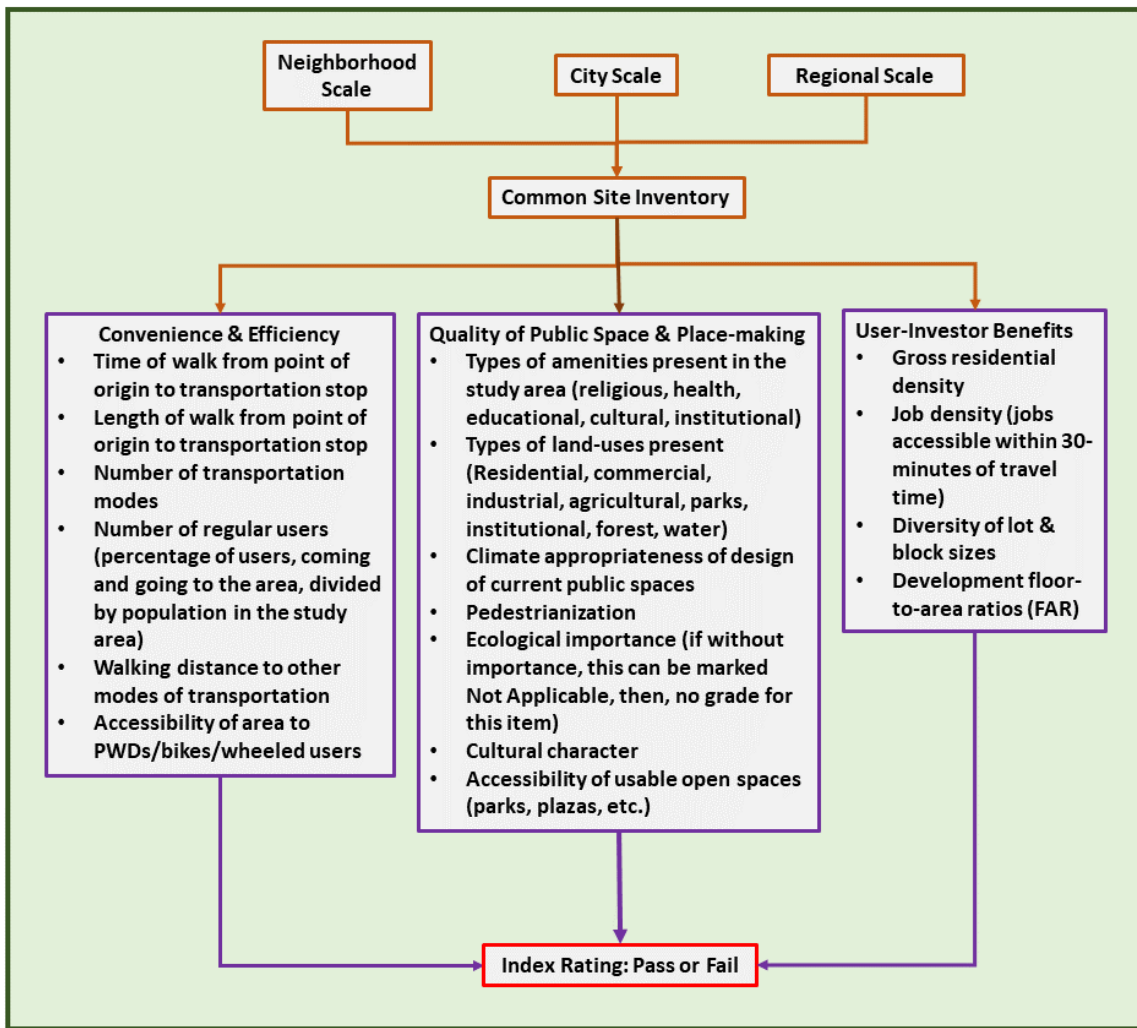


Image 1. TSI Tool Kit

Table 1. Sample TSI Grading Sheet

TOD Suitability Index				
Indicators	Details	Grading Scale (3, 1, 0) with 3 = Highest, and rubrics		
Node Value - (Primary Descriptors: Convenience & Efficiency)		3	1	0
Time of walk from point of origin to transportation stop		5-10 minutes walk	11-15 minutes walk	16 minutes or more walk
Length of walk from point of origin to transportation stop		within 400m	within 500m	more than 500m
Number of transportation modes		5 or more modes	3-4 modes	1-2 modes
Number of regular users (percentage of users, coming and going to the area, divided by population in the study area)		61% or more	31%-60%	30% and below
Walking distance to other modes of transportation		within 400m	within 500m	more than 500m
Accessibility of area to PWDs/bikes/wheeled users		Very accessible	Moderately accessible	Little to no accessibility
Weighted Average Node Value				
Place Value - (Primary Descriptors: Quality of Public Spaces, Place-making)		3	1	0
Types of amenities present in the study area (religious, health, educational, cultural, institutional)		3 or more types present	2 types present	1 type present
Types of land-uses present (Residential, commercial, industrial, agricultural, parks, institutional, forest, water)		3 or more types present	2 types present	1 type present
Climate appropriateness of design of current public spaces		Very evident	Evident	Not evident
Pedestrianization		Very evident	Evident	Not evident
Ecological importance (if without importance, this can be marked Not Applicable, then, no grade for this item)		With importance, with significant integrated design	With importance, with minor integrated design	With importance, without integrated design
Cultural character		Evident, with significant integrated design/provisions	Evident, without significant integrated design/provisions	Not evident
Accessibility of usable open spaces (parks, plazas, etc.)		within 400m	within 500m	more than 500m
Weighted Average Place Value				
Market Potential - (Primary Descriptors: User-Investor Potential)		3	1	0
Gross residential density (total sqm of study area: 4,042,112sqm)		15-25 gross sqm per person	25-35 gross sqm per person	35 and above gross sqm per person
Job density (jobs accessible within 30-minutes of travel time)		Within three or more CBDs or high job density areas	Within one-to-two CBDs or high job density areas	Within none
Diversity of lot & block sizes		High block & lot size cut variation	Medium block & lot size cut variation	Low block & lot size cut variation
Development floor-to-area ratios (FAR)		FAR maximized for at least 25% of the study area	FAR maximized for at least 10% of the study area	FAR maximized for less than 10% of the study area
Potential Value				
Total TSI Score				

Each criterion is described further below:

Node Value:

- Time of walk from point of origin to transportation stop – this is graded with the following parameters: 3pts (5-10 minutes' walk), 1pt (11-15 minutes' walk), 0pts (16 minutes or more).
- Length of walk from point of origin to transportation stop – this is graded with the following parameters: 3pts (within 400m), 1pt (within 500m), 0pts (more than 500m).
- Number of transportation modes – quantity of different modes of transportations that pass-thru and are usable by users. This is graded with the following parameters: 3pts (5 or more modes), 1pt (3-4 modes), 0pts (1-2 modes).
- Number of regular users (percentage of users, coming and going to the area, divided by the population of the study area) – general description of the frequency of users in the area, computed by totaling users coming and going to the area dividing it with the population of the study area. This is graded with the following parameters: 3pts (61percent or more), 1pt (31percent-60percent), 0pts (30percent and below).
- Walking distance to other modes of transportation – pedestrian connectivity and accessibility to different transportation mode stops, and hubs. This is graded with the following parameters: 3pts (within 400m), 1pt (within 500m), 0pts (more than 500m).
- Accessibility of area to PWDs/bikes/wheeled users – describes accessibility of all modes of transportation present in the area. This would include PWDs, bikers, passengers who are carrying wheeled luggage, and other related users. This is graded with the following parameters: 3pts (very accessible), 1pt (moderately accessible), 0pts (little to no accessibility).

Place Value:

- Types of amenities present in the study area (religious, health, educational, cultural, institutional) – This is graded with the following parameters: 3pts (3 or more types present), 1pt (2 types present), 0pts (1 type present).
- Types of land-uses present (residential, commercial, industrial, agricultural, parks, institutional, forest, water) – This is graded with the following parameters: 3pts (3 or more types present), 1pt (2 types present), 0pts (1 type present).
- Climate appropriateness of design – description of the climate affecting elements in the study area, i.e. rain shelters, and trees. This can also include flood, landslide, earthquake and storm surge mitigation designs in the area. This is graded with the following parameters: 3pts (very evident), 1pt (evident), 0pts (not evident).
- Pedestrianization – description of the streetscape character and pedestrian infrastructure of the study area. The more pedestrianized the area the higher the grade. This is graded with the following parameters: 3pts (very evident), 1pt (evident), 0pts (not evident).
- Ecological importance – describes the presence of ecologically important items, whether there are protected areas, biodiversity, etc. in the area. This includes any design or interventions that seek to protect these special items. This is graded with the following parameters: 3pts (with importance, with significant integrated design), 1pt (with importance, with minor integrated design), 0pts (with importance, without integrated design), and N/A (not applicable for the area because there is not ecological importance in the area, this is no counted in the weighted average grade).
- Cultural character – describes the presence or absence of the unique cultural character of the area. This considers the spirit-of-place of the study area. This is graded with the

following parameters: 3pts (evident, with significant integrated design/provisions), 1pt (evident, without integrated design/provisions), 0pts (not evident).

- Accessibility of usable open spaces (parks, plazas, etc.) – describes the proximity and physical accessibility of usable open spaces from points of origin. This is graded with the following parameters: 3pts (within 400m), 1pt (within 500m), 0pts (more than 500m).

Market Potential Value:

- Gross residential density – the total population of the study area divided by the total square area of the study area. This is graded with the following parameters: 3pts (15-25 gross sqm per person), 1pt (25-35 gross sqm per person), 0pts (35 and above gross sqm per person).
- Job density (jobs accessible within 30 minutes of travel time) – high job opportunity areas that are available to the residents in the study area within a 30 minutes of travel time. This is graded with the following parameters: 3pts (within three or more CBDs or high job density areas), 1pt (within one-to-two CBDs or high job density areas), 0pts (within none).
- Diversity of lots and block sizes – describes the size of lot cuts and land parcels, and block sizes in the study area. This is graded with the following parameters: 3pts (high block and lot size cut variation), 1pt (medium block and lot size cut variation), 0pts (low block and lot size cut variation).
- Development floor-to-area ratios (FAR) – the general FAR in developments in the study area. This is graded with the following parameters: 3pts (FAR maximized for at least 25percent of the study area), 1pt (FAR maximized for at least 10percent of the study area), 0pts (FAR maximized for less than 10percent of the study area).

The detailed process in using the TSI is enumerated here:

- Select the study area to be tested with the TSI.
 - Due to the flexibility of the tool, this can be used on any site, but if the user opts to use this in an already potential TOD, it is recommended for the user of the tool to determine the site by considering the following characteristics:
 - Scale of TOD
 - Multiple modes of transportation
 - Presence of open spaces
 - Potential residential and job opportunities
- Site inventory of the study area should be done with the aid of the Summary of Site Inventory which enumerates the characteristics that need to be identified.
 - The inventory items will be used as a reference for the usage of the TSI, where various criteria are graded to determine a score for each value group.
- Grading Process
 - Each criterion has a grade (3, 1, and 0) with corresponding description which would serve as a guide to the user assessing the study area.

Computation of Weighted Average and Total Score: Each value group has a maximum weighted average of 1. The value group totals are then averaged to solve for the final score. If the final score is below 50 percent, then it has failed and would need major investments and developments to improve and become more suitable to be a TOD. When the score is 50 percent and above, the study area is suitable to be a TOD and further improvement in score will mean its effectivity as a TOD would also increase.

Table 2. Sample Table Summary of Results & Recommendations

Summary of Results & Recommendations		
Value Group	Study Area - Scores and Recommendations	
	<i>(Study Area)</i>	<i>Recommendation Summary</i>
Node Value - (Primary Descriptors: Convenience & Efficiency)	<i>(Total Grade for this value)</i>	<i>(Recommendations for this value group based on the total grade and individual item scoring)</i>
Place Value - (Primary Descriptors: Quality of Public Spaces, Place-making)	<i>(Total Grade for this value)</i>	<i>(Recommendations for this value group based on the total grade and individual item scoring)</i>
Market Potential - (Primary Descriptors: User-Investor Potential)	<i>(Total Grade for this value)</i>	<i>(Recommendations for this value group based on the total grade and individual item scoring)</i>
Total TSI Score	<i>(Average of all given grades)</i>	
Consolidated Recommendation	<i>(Over-all recommendation to improve the grade of the study area)</i>	

Table 3. Summary of Site Inventory with Guide Questions

SUMMARY OF SITE INVENTORY	
Physical description	What are the physical characteristics of the site. (Hilly, flat, etc.)?
Geographical description	What are the characteristics of the various areas around and related to the study area?
Generally, is the place being used? How? Why?	What is the general usage of the area upon observation/interaction with its users?
Culture and Social Development	
Education	Is there a presence and/or concentration of various educational institutions of various educational levels within the study area?
Religious Establishments	Is there are presence and/or concentration of various religious institutions within the study area?
Government Services	Is there a presence and/or concentration of various government services within the study area?
Health services	Is there presence and/or concentration of various health-related facilities within the study area?
Identity of Place	What characterizes the area's identity as a location. (Example: tourist area, area known for shopping malls, etc.)?
Presence of Heritage Sites	Is there a presence and/or concentration of important cultural, pertinent heritage and/or protected sites within the study area?
Sustainability	
Energy/water consumption	Are there any sustainable energy/water practices being done in the area?
Types of Land usage and interactions	What are the land uses present in the study area (ex: residential, commercial, institutional, industrial, etc.) and how users in the area interact with these different land uses?
Urban Design Form	
Opportunities of physical social interaction	How will you describe how users are able to interact with other people in the area? Do they interact within park areas, streetscapes, shopping malls? This will help in determining the spaces that would need improvement.
Connectivity of spaces	How will you describe how the users are able to move from one place to the other. Are there constraints to their movement, like lack of PWD ramps, large highways, impermeable city blocks?
Ecological Criteria	
Presence of Biodiversity	Is there current or previous presence of biodiversity in the area?
Presence of Waterfront	Is the area nearby the waterfront (fresh or saltwater)?
Ecosystem Services	Are there any ecosystem services currently produced by the study area?
Transportation	
Connectivity with adjacent Urban and/or Rural Areas	How does the study area connect to other adjacent urban and/or rural areas? What modes of transportation are present? How do users move from one place to the other? How do they move within study area?
Modes of transportation available	What are the different modes of transportation available to the users? Are these just for use within the local community and study area? What are used to travel to other cities and/or provinces?
Sustainability of existing transportation	If the population of the study area continues to increase, what possible impacts would it have to the existing transportation system in the area? Would it be able to accommodate more users given its current state?

5. SAMPLE USAGE OF THE TSI

Method on how the case studies were done, site evaluation through landscape architectural point of view and not yet through FGD. A current limitation of the study was time constraint therefore establishment of a group to conduct the study together with the current evaluators. Moreover, the study focuses on the establishment of the criteria for the TSI wherein the results of the case studies are not the primary focus of the study. The study will only be up to the formulation of the suitability index and its usage with the sample areas. The tool was made to have an objective grading system while having subjective recommendations. This includes biases in impressions in place-making wherein various users of the tool can evaluate the study area and, compare and collaborate recommendations based on the biases provided.

Site selection was done by comparing characteristics of various locations under each TOD scale category (neighborhood, city, and region). The site selection method in this study is not used in other applications of the TSI because it is for TODs of varying scales. The site selection methodology for testing TSI depends on the users' objectives. The boundary of each scale category are as follows: (1) Neighborhood – the entire population of the neighborhood within the boundaries of the barangays that will be directly affected by the possible main transit hub. Main transit hubs can be an area or a collector road common to all barangays. (2) City – The 500-m radius around a current/possible major transport hub with modes of city-to-city transport will be the boundary of the study area for this scale. This covers the immediate area of the transport hub, including users' origins and destinations and modal transfer facilities. (3) Regional – The one-km radius around a current/possible major transport hub with modes of transport servicing inter-regional/provincial routes describes the boundary of the study area of this scale. This considers the immediate area of the transport hub that includes users' origins, destinations and modal transfers. Also included are further adjacent areas serviced by the hub.

The TSI was tested in one of the major cities in Metro Manila to verify its effectivity. The Quezon City sites were selected because these areas have been designated as growth areas by the city's CLUP 2011-2025.

Multi-Centered Growth Areas (Concept Map)

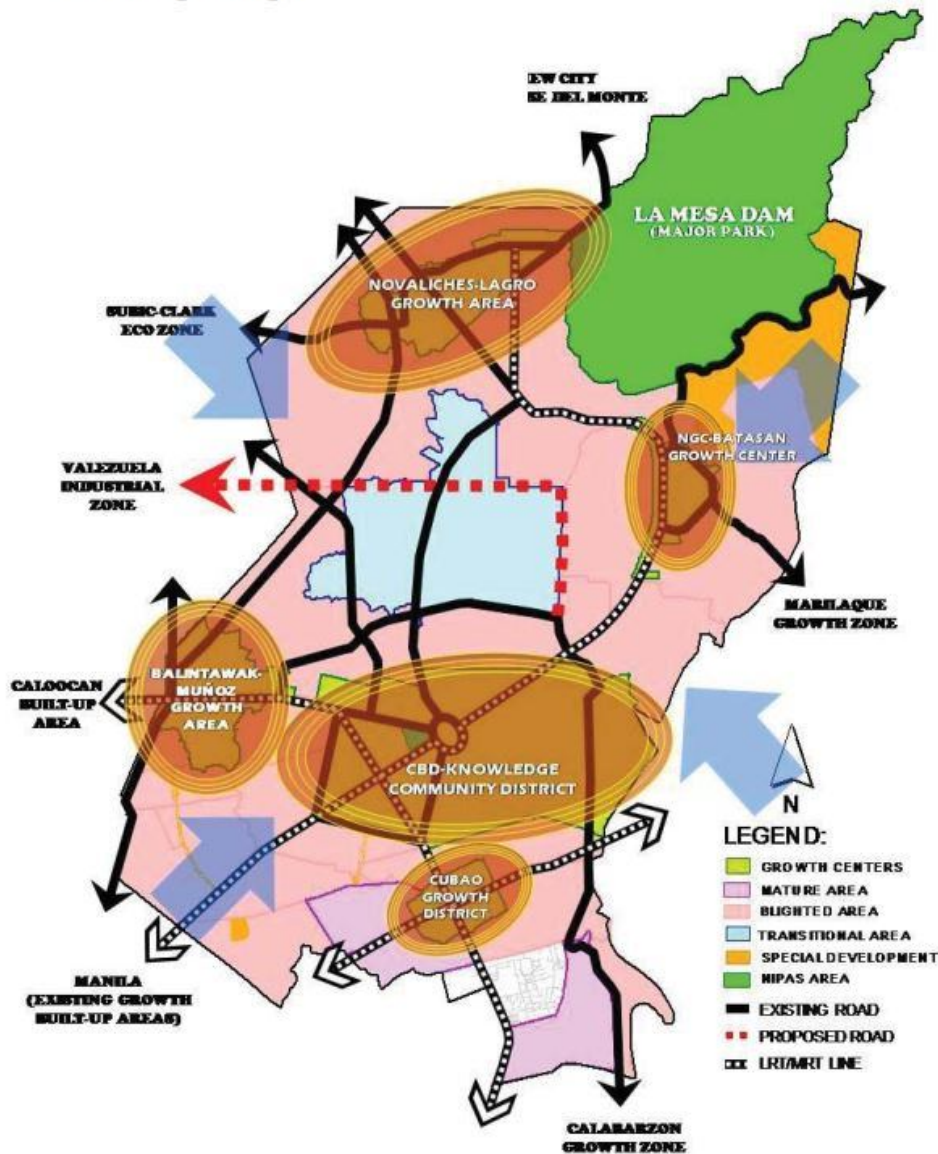


Figure 2. Quezon City Multi-Centered Growth Areas (Concept Map)

Maginhawa, teacher's village study area is in the heart of the CBD-knowledge community district wherein prominent universities, government buildings and residential are located. This presents an opportunity for the area to be a major transit station that will connect the whole district and connect to other growth centers. Maginhawa St. is the main thoroughfare where most forms of public and private transportation pass. It generates most traffic along the area. The potential of this street (that has multiple nodes along it) or other prominent local neighborhood streets or nodes to provide means of easier access of public transportation and improvement of pedestrianization and reduce automobile dependency.

Table 4. TSI Usage for Maginhawa Study Area

TOD Suitability Index - Maginhawa				
Indicators	Details	Grading Scale (3, 1, 0) with 3 = Highest, and rubrics		
Node Value - (Primary Descriptors: Convenience & Efficiency)		3	1	0
Time of walk from point of origin to transportation stop	Most walks toward transportation stops will take 11-15 minutes.	5-10 minutes walk	11-15 minutes walk	16 minutes or more walk
Length of walk from point of origin to transportation stop	Most transportation stops are within 500m of points of origin.	within 400m	within 500m	more than 500m
Number of transportation modes	Tricycle, jeep, bus, and taxi	5 or more modes	3-4 modes	1-2 modes
Number of regular users (percentage of users, coming and going to the area, divided by population in the study area)	Most public transportation users come from Krus Na Ligas (designated as informal settlement) because Teacher's Village residents use automobiles. During the morning rush hour, more than a thousand outgoing residents were tallied in one prominent transportation stop.	61% or more	31%-60%	30% and below
Walking distance to other modes of transportation	Currently, users must take a jeepney or bus towards the nearest MRT station, but an MRT station is being built along Commonwealth Avenue near Philcoa. This gives the neighborhood bigger need for accessing this train station.	within 400m	within 500m	more than 500m
Accessibility of area to PWDs/bikes/wheeled users	Most spaces and sidewalks have little accessibility for PWDs and bicycles.	Very accessible	Moderately accessible	Little to no accessibility
Weighted Average Node Value	0.44	6.00	2.00	0.00
Place Value - (Primary Descriptors: Quality of Public Spaces, Place-making)		3	1	0
Types of amenities present in the study area (religious, health, educational, cultural, institutional)	Religious, health, and educational amenities are present.	3 or more types present	2 types present	1 type present
Types of land-uses present (Residential, commercial, industrial, agricultural, parks, institutional, forest, water)	Residential, commercial and institutional land-uses are present.	3 or more types present	2 types present	1 type present
Climate appropriateness of design of current public spaces	Current streetscape design does not cater for comfortable tropical weather conditions. There is a lack in shade structures and anti-urban heat island measures.	Very evident	Evident	Not evident
Pedestrianization	There is more priority to vehicles in the area rather than to pedestrians, while the streets are pedestrian accessible, there are no dedicated areas for pedestrianized-use and the sidewalks are quite small to accommodate pedestrian population in the area.	Very evident	Evident	Not evident
Ecological importance (if without importance, this can be marked Not Applicable, then, no grade for this item)	No ecological importance in the area. Not applicable.	With importance, with significant integrated design	With importance, with minor integrated design	With importance, without integrated design
Cultural character	Cultural character of the area is becoming to be as a food hub. However, this kind of culture is not yet prominent.	Evident, with significant integrated design/provisions	Evident, without significant integrated design/provisions	Not evident
Accessibility of usable open spaces (parks, plazas, etc.)	The nearest open spaces to the area is more than 500m away.	within 400m	within 500m	more than 500m
Weighted Average Place Value	0.28	6.00		0.00
Market Potential - (Primary Descriptors: User-Investor Benefits)		3	1	0
Gross residential density (total sqm of study area: 1,763,892sqm)	20.38sqm per person, this density is acceptable in terms of this residential area type. However, this might be because of the fact that KNL baranggay is a heavily dense informal settler area that are also the primary source of users in the area.	15-25 gross sqm per person	25-35 gross sqm per person	35 and above gross sqm per person
Job density (jobs accessible within 30-minutes of travel time)	Accessible job hotspots in the area are located in the BPOs in Eton Centris along EDSA, Ayala TechnoHub along Commonwealth Ave., and Cubso. Various job opportunities are found within the vicinity of Quezon City. However, most would still travel to other CBDs such as Eastwood (QC), Ortigas, or Makati but these places will take from 1.5-2 hours via commute.	Within three or more CBDs or high job density areas	Within one-to-two CBDs or high job density areas	Within none
Diversity of lot & block sizes	Standard lots sizes with varying block sizes approximately 150m long	High block & lot size cut variation	Medium block & lot size cut variation	Low block & lot size cut variation
Development floor-to-area ratios (FAR)	General FAR of the residential units are quite low because there are mostly single detached homes with at most two floors. However, there are emerging new townhouse developments with up to four floors and other mixed-use condominiums.	FAR maximized for at least 25% of the study area	FAR maximized for at least 10% of the study area	FAR maximized for less than 10% of the study area
Potential Value	0.42	3.00	2.00	0.00
Total TSI Score	0.38	Failed & unsuitable with below average score		

Table 5. Summary of Site Inventory – Maginhawa Study Area

SUMMARY OF SITE INVENTORY - Maginhawa	
Physical description	Relatively flat with few gentles slopes that are directed westwards of the area
Geographical description	The study area is in Quezon City. It is nearby the City Hall, Quezon Memorial Circle, and University of the Philippines. It has access to various hospitals nearby the study site. The area is bounded by Elliptical road (North), Maginhawa St. (East), Kalayaan Ave. (West), and V. Luna Ave. Ext. (South). The study area includes the various baranggays areas along the stretch of Maginhawa St.
Generally, is the place being used? How? Why?	The area is mainly residential but the appearance of commercial establishments (primarily food and dining) has influenced the LGU to dub the area as a "Food Hub".
Culture and Social Development	
Education	Various pre-school to high school education facilities are present. The area is very close to many colleges and universities.
Religious Establishments	Various kinds of religious affiliations are located or nearby the study area (Christian, Catholic, Iglesia ni Cristo)
Government Services	Only local government services are located in the area but the City hall is very near the area.
Health services	There are no major health services in the area. The closest one is along V. Luna Avenue (AFP Medical Center), and East Avenue, where the Philippine Heart Center and East Avenue Medial Center are located.
Identity of Place	The current identity of the area is a food hub with many different food establishments present and the main reason visitors go here is because of the different food they can try out.
Presence of Heritage Sites	There are no pertinent heritage sites in the area but it is very close to the Quezon City Memorial Circle.
Sustainability	
Energy/water consumption	There is no notable energy/water conservation technologies present in the area.
Types of Land usage and interactions	As per the Quezon City 2004 Zoning Map, the area is a mix of residential zones with institutional portions which cover school grounds. However, it is interesting to note the emergence of various commercial establishments in the area, as well as, the promotion of the city government that the area is a food hub.
Urban Design Form	
Opportunities of physical social interaction	There are no prominent public park or open space in the study area. People normally interact along the high traffic streets or within commercial establishments. There has been a rise of "food parks" wherein multiple concessionaires are grouped together in a courtyard pattern with common a dining space.
Connectivity of spaces	Aforementioned food parks are not linked because they are privately owned and developed . The various high traffic streets are interconnected but the concentration of users is where the most sought after establishments are located. These locations sprang up their own makeshift tricycle terminals to cater to public transportation users.
Ecological Criteria	
Presence of Biodiversity	There is no notable presence of biodiversity.
Presence of Waterfront	There is no waterfront in the study area
Ecosystem Services	There is no notable ecosystem services in the study area.
Transportation	
Connectivity with adjacent Urban and/or Rural Areas	Connectivity with other cities is first by tricycle to a jeepney or bus stop. Taxis are also available. Trains are one jeep away.
Modes of transportation	Vehicular transportation is the primary mode while some residents tend to walk and forego the tricycle and some use bicycles if their destination is nearby. However, most still use private transportation and this is evident because of the amount of cars using street side parking within the inner streets
Sustainability of existing transportation	

Table 6. Summary of Results and Recommendations – Maginhawa Study Area

Summary of Results & Recommendations		
Value Group	Study Area - Scores and Recommendations	
	Maginhawa	Recommendation Summary
Node Value - (Primary Descriptors: Convenience & Efficiency)	0.44	There should be better consideration for pedestrian, PWD and bike access to transport stops, and higher modes of transportation (trains & buses).
Place Value - (Primary Descriptors: Quality of Public Spaces, Place-making)	0.28	Improvement of user interactions through better urban design for increase in public open spaces and improved streetscapes.
Market Potential - (Primary Descriptors: User-Investor Potential)	0.42	Increase job density and FAR of residential and commercial infrastructures to increase potential user traffic in the area.
Total TSI Score	0.38	
Consolidated Recommendation	Infill development with primary focus on increased pedestrian activity through better public open spaces.	

The SM North study area is in the periphery of the CBD-Knowledge Community district and very near the Balintawak-Munoz Growth area which will be a prominent gateway to the northern provinces such as Bulacan and the cities of Manila, Caloocan, Malabon, Navotas, and Valenzuela. SM North shows the capacity of a commercial area to function as a node that drives public transport. It already has various forms of public transportation that pass through here. Moreover, there are several residential areas and rising CBD in the Vertis North area.

Table 7. TSI Usage for SM North Study Area

TOD Suitability Index - SM North				
Indicators	Details	Grading Scale (3, 1, 0) with 3 = Highest, and rubrics		
Node Value - (Primary Descriptors: Convenience & efficiency)		3	1	0
Time of walk from point of origin to transportation stop	Some areas are more than 16 minutes walk from points of origin.	5-10 minutes walk	11-15 minutes walk	16 minutes or more walk
Length of walk from point of origin to transportation stop	Some areas have transportation stops more than 500m away.	within 400m	within 500m	more than 500m
Number of transportation modes	One nearby LRT line (Roosevelt station) and MRT line (North Ave. station); various jeepney routes, FX routes, bus routes; tricycle stop for the adjacent residential areas are also present	5 or more modes	3-4 modes	1-2 modes
Number of regular users (percentage of users, coming and going to the area, divided by population in the study area)	The most users come from the various residential areas around the SM North area. Since the area has different modes of transportation terminals, people use this area as route change to reach their destination. This means that users from other places treat this area as a half-way stop.	61% or more	31%-60%	30% and below
Walking distance to other modes of transportation	The residential area adjacent to the study area is not too conducive for walking/cycling towards the public transportation terminals. Users are more inclined to use tricycles to go to these terminals.	within 400m	within 500m	more than 500m
Accessibility of area to PWDs/bikes/wheeled users	Most spaces and sidewalks have little accessibility for PWDs and bicycles.	Very accessible	Moderately accessible	Little to no accessibility
Weighted Average Node Value	0.33	6.00		0.00
Place Value - (Primary Descriptors: Quality of Public Spaces, Place-making)		3	1	0
Types of amenities present in the study area (religious, health, educational, cultural, institutional)	Religious, health, and educational amenities are present.	3 or more types present	2 types present	1 type present
Types of land-uses present (Residential, commercial, industrial, agricultural, parks, institutional, forest, water)	Residential, commercial and institutional land-uses are present.	3 or more types present	2 types present	1 type present
Climate appropriateness of design of current public spaces	Current streetscape design does not cater for comfortable tropical weather conditions. There is a lack in shade structures and anti-urban heat island measures.	Very evident	Evident	Not evident
Pedestrianization	There is more priority to vehicles in the area rather than to pedestrians, while the streets are pedestrian accessible, there are no dedicated areas for pedestrianized-use and the sidewalks are quite small to accommodate pedestrian population in the area.	Very evident	Evident	Not evident
Ecological importance (if without importance, this can be marked Not Applicable, then, no grade for this item)	No ecological importance in the area. Not applicable.	With importance, with significant integrated design	With importance, with minor integrated design	With importance, without integrated design
Cultural character	There is no clear cultural character in the study area.	Evident, with significant integrated design/provisions	Evident, without significant integrated design/provisions	Not evident
Accessibility of usable open spaces (parks, plazas, etc.)	The nearest open spaces to the area is more than 500m away.	within 400m	within 500m	more than 500m
Weighted Average Place Value	0.33	6.00		0.00
Market Potential - (Primary Descriptors: User-Investor Benefits)		3	1	0
Gross residential density (total sqm of study area: 1,433,972sqm)	53,23sqm per person is a sparse value in terms of gross residential density. This is because of the low capacity dwellings in the nearby area and the area of expanse covered by the SM North EDSA Mall itself.	15-25 gross sqm per person	25-35 gross sqm per person	35 and above gross sqm per person
Job density (jobs accessible within 30-minutes of travel time)	Accessible job hotspots in the area are located in the BPOs in Eton Centris along EDSA, Ayala TechnoHub along Commonwealth Ave., and Cubao. Various job opportunities are found within the vicinity of Quezon City. However, most would still travel to other CBDs such as Eastwood (QC), Ortigas, or Makati but these places will take from 1.5-2 hours via commute. Opportunities for work in Bulacan, and the northern part of Manila are also possibilities for users from this area.	Within three or more CBDs or high job density areas	Within one-to-two CBDs or high job density areas	Within none
Diversity of lot & block sizes	Cuts of each parcel are quite big thus restricting permeability and easier pedestrian access in the area.	High block & lot size cut variation	Medium block & lot size cut variation	Low block & lot size cut variation
Development floor-to-area ratios (FAR)	General FAR of the residential units are quite low because there are mostly single detached homes with at most two floors.	FAR maximized for at least 25% of the study area	FAR maximized for at least 10% of the study area	FAR maximized for less than 10% of the study area
Potential Value	0.17		2.00	0.00
Total TSI Score	0.28	Failed & unsuitable with below average score		

Table 8. Summary of Site Inventory – SM North Study Area

SUMMARY OF SITE INVENTORY - SM North	
Physical description	The study area is relatively flat with no notable geographical features. The north most edge in the study area is the San
Geographical description	The study area is located to the north of Metro Manila. It is the area in the north that is the meeting point of buses, jeeps, FXs, MRT and LRT. It generally serves as the gateway to the northern provinces like Bulacan and Pampanga.
Generally, is the place being used? How? Why?	The area is generally used as a commercial area because of the malls and as a place to transfer from one mode of transportation to the other because of the presence of various modes and their destinations.
Culture and Social Development	
Education	There are various educational institutions present around the study area. Various levels of education (grade school to high school to college institutions) are observed. Both public and private schools are present.
Religious Establishments	There are a few religious structures within the study area which include the following religions like Catholic and Christian.
Government Services	There are several government satellite offices, such as SSS, DepEd, and Immigration, present in the study area. Various gover
Health services	There are no health institutions within the study site, aside from the ones that are located within the malls.
Identity of Place	The current identity of the area is a mall complex where people can shop, dine and stay inside the mall. Users pass time in this area or use it to mode from one mode of transportation to the other.
Presence of Heritage Sites	There are no pertinent heritage sites in the area.
Sustainability	
Energy/water consumption	The mall (SM North EDSA) itself has installed solar panels as added energy source for the mall's consumption.
Types of Land usage and interactions	Various land uses are designated within the study area. This includes institutional (for the public schools), major & metropolitan commercial zone (malls), and high-density residential. The interaction between the land uses are very fluid because the residents of nearby areas have direct access to the malls via tricycle or walking.
Urban Design Form	
Opportunities of physical social interaction	Most interactions are done within the mall structures because there are no open spaces that can be used by people. In the outdoor environment, walkways and waiting areas are the most consistent place wherein people and users interact.
Connectivity of spaces	Connectivity of spaces are existent only thru the existing road ways. There are no connecting landscape or streetscapes within the study area.
Ecological Criteria	
Presence of Biodiversity	There is no notable presence of biodiversity.
Presence of Waterfront	There is no waterfront in the study area.
Ecosystem Services	There is no notable ecosystem services in the study area.
Transportation	
Connectivity with adjacent Urban and/or Rural Areas	The study area has its own urban and rural areas. They are connected by the local transportation mode (tricycle). Streetscapes are not developed to be pedestrian-friendly which initiates the preference of users to use tricycles, even if the travel distance is very minimal.
Modes of transportation available	Available transportation modes are tricycles, jeepneys, buses, public utility vans, buses and nearby MRT and LRT (not within the study area) stations. Parking slots for private vehicles and motorcycles are also available inside the malls. This makes SM North EDSA a hub of commuters and acts as a staging ground for users to transition from one mode of transportation to the next. However, there is no central area for which all modes of transportation converge cohesively. This leads to buses clogging the EDSA due to the insufficient space in comparison to the number of buses using the pick-up and drop-off point.
Sustainability of existing transportation	Being attached to a commercial establishment, the transportation hubs and its respective users are greatly affected by the mall activities such as sales, which generate a massive amount of traffic that increases the amount of travel time from 15minutes to, at most, 1 hour.

Table 9. Summary of Results and Recommendations – SM North Study Area

Summary of Results & Recommendations		
Value Group	Study Area - Scores and Recommendations	
	SM North EDSA	Recommendation Summary
Node Value - (Primary Descriptors: Convenience & Efficiency)	0.33	There should be better pedestrian connectivity from points of origin to transport stops and between the various modes of transportation present in the area. This will increase convenience and efficiency of the users.
Place Value - (Primary Descriptors: Quality of Public Spaces, Place-making)	0.33	Improved urban design will increase foot traffic in the area by giving open space opportunities and pedestrian-use conducive streetscapes.
Market Potential - (Primary Descriptors: User-Investor Potential)	0.17	Better residential density and development flexibility will provide better demand and encourage investors to improve on the area. This will further open up possibilities for increase of jobs and intensification of commercial establishments in the area.
Total TSI Score	0.28	
Consolidated Recommendation	Intensification development with primary focus on increased residential density through better accessible housing options and supporting public open spaces.	

The Cubao study area is the primary focus area of the Cubao Growth District. There is a known potential if the current area is redeveloped to be more attractive to visitors and users because there are other commercial areas that people frequent more than this area. There are multiple modes of transportation in the area that allow inter-regional connections.

Table 10. TSI Usage for Cubao Study Area

TOD Suitability Index - Cubao				
Indicators	Details	Grading Scale (3, 1, 0) with 3 = Highest, and rubrics		
Node Value - (Primary Descriptors: Convenience & Efficiency)		3	1	0
Time of walk from point of origin to transportation stop	Some areas are more than 11-15 minutes walk from points of origin.	5-10 minutes walk	11-15 minutes walk	16 minutes or more walk
Length of walk from point of origin to transportation stop	Some areas have transportation stops are within 500m.	within 400m	within 500m	more than 500m
Number of transportation modes	MRT and LRT lines both have stations in the Cubao area. There various bus, jeep, and FX terminals for provincial routes. There are also various city routes for these transport modes as well. Tricycles are present in the residential areas but these are not allowed in main roads and inside the central business district.	5 or more modes	3-4 modes	1-2 modes
Number of regular users (percentage of users, coming and going to the area, divided by population in the study area)	Generally, northbound passengers slight in the area more than those riding further north. Southbound passengers use Cubao as a riding point for south destinations like Makati and Ortigas. Furthermore, passengers going to and from the MRT and LRT are also taken into account.	61% or more	31%-60%	30% and below
Walking distance to other modes of transportation	The residential area adjacent to the study area is not too conducive for walking/cycling towards the public transportation terminals. Users are more inclined to use tricycles to go to these terminals.	within 400m	within 500m	more than 500m
Accessibility of area to PWDs/bikes/wheeled users	Most spaces and sidewalks have little accessibility for PWDs and bicycles.	Very accessible	Moderately accessible	Little to no accessibility
Weighted Average Node Value	0.44	6.00	2.00	0.00
Place Value - (Primary Descriptors: Quality of Public Spaces, Place-making)		3	1	0
Types of amenities present in the study area (religious, health, educational, cultural, institutional)	Religious, health, and educational amenities are present.	3 or more types present	2 types present	1 type present
Types of land-uses present (Residential, commercial, industrial, agricultural, parks, institutional, forest, water)	Residential, commercial and institutional land-uses are present.	3 or more types present	2 types present	1 type present
Climate appropriateness of design of current public spaces	Current streetscape design does not cater for comfortable tropical weather conditions. There is a lack in shade structures and anti-urban heat island measures.	Very evident	Evident	Not evident
Pedestrianization	There is more priority to vehicles in the area rather than to pedestrians, while the streets are pedestrian accessible, there are no dedicated areas for pedestrianized-use and the sidewalks are quite small to accommodate pedestrian population in the area.	Very evident	Evident	Not evident
Ecological importance (if without importance, this can be marked Not Applicable, then, no grade for this item)	No ecological importance in the area. Not applicable.	With importance, with significant integrated design	With importance, with minor integrated design	With importance, without integrated design
Cultural character	There is no clear cultural character in the study area.	Evident, with significant integrated design/provisions	Evident, without significant integrated design/provisions	Not evident
Accessibility of usable open spaces (parks, plazas, etc.)	The nearest open spaces to the area is more than 500m away.	within 400m	within 500m	more than 500m
Weighted Average Place Value	0.33	6.00		0.00
Market Potential - (Primary Descriptors: User-Investor Benefits)		3	1	0
Gross residential density (total sqm of study area: 4,042,112sqm)	45.53sqm per person is too sparse in terms of gross residential density. This is because the various residential areas around the area are low capacity dwellings.	15-25 gross sqm per person	25-35 gross sqm per person	35 and above gross sqm per person
Job density (jobs accessible within 30-minutes of travel time)	Accessible job hotspots in the area are located in the BPOs in Eton Centris along EDSA, Eastwood City, and within the area. Various job opportunities are found within the vicinity of Quezon City. However, most would still travel to other CBDs such as Ortigas, or Makati but these places will take from 30 minutes-1.5 hour via commute. Opportunities for work in Mandaluyong and San Juan areas are also possibilities for users from this area.	Within three or more CBDs or high job density areas	Within one-to-two CBDs or high job density areas	Within none
Diversity of lot & block sizes	Cuts of each parcel are quite big thus restricting permeability and easier pedestrian access in the area.	High block & lot size cut variation	Medium block & lot size cut variation	Low block & lot size cut variation
Development floor-to-area ratios (FAR)	General FAR of the residential units are quite low because there are mostly single detached homes with at most two floors.	FAR maximized for at least 25% of the study area	FAR maximized for at least 10% of the study area	FAR maximized for less than 10% of the study area
Potential Value	0.25	3.00		0.00
Total TSI Score	0.34	Failed & unsuitable with below average score		

Table 11. Summary of Site Inventory – Cubao Study Area

SUMMARY OF SITE INVENTORY - Cubao	
Physical description	The study area is relatively flat with no notable geographical features. The north most edge in the study area is a tributary of the San Juan River.
Geographical description	Cubao is located to the east of Metro Manila near Antipolo. Being almost at the center of the National Capital Region, most provincial bus terminals are located here. Many city public transportation routes pass thru this area as well. The MRT and LRT-2 pass through this area. The study area is the main CBD area and its nearby areas approximately within a 1 kilometer radius. It is bound by the San Juan River tributary to the north, 20th Avenue to the east, E. Rodriguez Ave. to the west and Boni Serrano Ave. to the south.
Generally, is the place being used? How? Why?	Similar to SM North area, the area is used primarily as a commercial area because of its malls and various stores. However during rush hours (morning and afternoon), the area becomes the receiving area for those coming from other places (such as Rizal province) and using either the MRT or LRT, and possibly, bus lines along EDSA. The high number of provincial bus terminals in the area shows that Cubao also serves regional transportation options.
Culture and Social Development	
Education	There are more than 15 different schools in the study area. Both private and public institutions are present. Most are up to the high school level education, with a few higher education schools.
Religious	There are both Catholic churches and Christian worship places present in the area.
Government Services	Satellite offices for government offices are located within some of the malls inside Cubao while there are separate locations of Social Security System and Land Transportation Office also in the area.
Health services	There are no major health service in the area such a hospital. However, there are clinics present within the malls for check-ups and laboratory tests.
Identity of Place	The Araneta Coliseum, one of the first major events places in the city, is located here and it is one of the most iconic places in the area. This makes the area unique and it generates more visitors during events.
Presence of Heritage	There are no prominent heritage sites in the area, unless one considers the Araneta Coliseum a heritage site.
Sustainability	
Energy/water	There is notable energy sustainability strategy is by using energy efficient lighting and ventilation systems.
Types of Land usage and interactions	The main land-use of the area is commercial with few institutional areas and residential areas outside of the main commercial core. The residential areas have access through tricycles and walking (although the streetscape is not designed for pedestrians).
Urban Design Form	
Opportunities of physical social interaction	Most interaction outdoors happen along the streetscape when moving from one establishment to the other. There are no public open spaces for interaction. Inside the malls, there are possibilities for interaction but people mostly pass-thru the mall areas for convenience and do not stay there like in a park.
Connectivity of spaces	Some of the mall establishments are connected via covered walkways. The streetscape does not have appropriate rain covering or sun shading (natural or artificial) and these are the primary connections within the area.
Ecological Criteria	
Presence of Biodiversity	There is no notable presence of biodiversity.
Presence of Waterfront	There is no waterfront in the study area.
Ecosystem Services	There is no notable ecosystem services in the study area.
Transportation	
Connectivity with adjacent Urban and/or Rural Areas	The study area has its own urban and rural areas. They are connected by the local transportation mode (tricycle). Streetscapes are not developed to be pedestrian-friendly which inates the preference of users to use tricycles, even if the travel distance is very minimal.
Modes of transportation available	Current transportation available are jeeps, buses, FXs, MRT, and LRT. There are also tricycles available for closer travels (within residential areas). Jeeps have no designated terminals or stops while city buses only pass-by and drop-off people along EDSA underneath the MRT station. Provincial buses have different locations depending on the bus line and this makes moving from one mode of transportation to the other. FXs have a different terminal for each cluster of destinations.
Sustainability of existing transportation	

Table 12. Summary of Results and Recommendations – Cubao Study Area

Summary of Results & Recommendations		
Value Group	Study Area - Scores and Recommendations	
	Cubao	Recommendation Summary
Node Value - (Primary Descriptors: Convenience & Efficiency)	0.44	There should be better pedestrian connectivity between the various terminals and modes of transportation present in the area. This will increase convenience and efficiency of the users.
Place Value - (Primary Descriptors: Quality of Public Spaces, Place-making)	0.33	More public open spaces will potentially increase user interaction with businesses located around the area.
Market Potential - (Primary Descriptors: User-Investor Potential)	0.25	Current residential and job density would need to increase to encourage more investors to develop other parts of the study area. This would also increase user traffic into the commercial areas.
Total TSI Score	0.34	
Consolidated Recommendation	Transformation development with primary focus on increase in market potential (residential, job, & developments) with massive improvements for open spaces and streetscape developments.	

The study areas represented three different TOD situations in terms of scale. Using the same criteria and index for each study area, the user of the TSI was able to derive study area-specific recommendations. With this in mind, city officials and planners from different countries can apply this methodology to their own cities.

6. CONCLUSION & RECOMMENDATIONS

The TSI grading system and results pinpoint the values of low and high grades of a site as a TOD. This allows the user to determine areas for improvement. This helps in goal setting especially for multi-sectoral projects wherein it is very important to have a clear over-arching goal and objectives as the development progresses. As shown in the different study areas, the criteria are the same, yet site specific recommendations can be done. The TSI is a convenient alternative planning tool across different planning scales with reliable criteria and grading parameters that will help pinpoint the areas suitable for TODs or help improve existing TOD areas.

Although the method in which these conducted its case study only dealt with expert opinion, it is recommended that in future applications multiple stakeholders and technical working groups should use the tool to generate varied biases on current situation and recommendations varying on their fields of expertise or social interest.

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