Structurally Analysing the Impact of Pedestrian Network Centrality and Path Characteristics on Pedestrian Density in Asian Station Environments

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Structurally Analysing the Impact of Pedestrian Network Centrality and Path Characteristics on Pedestrian Density in Asian Station Environments

アジア地域の都市鉄道駅周辺における歩行者ネットワークの中心性および街路特性が歩行者密度に及ぼす影響に関する構造分析

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Summary

Pedestrians interact with the environment through a complex network of exclusive and shared paths that comprise the pedestrian network. These networks tie together all transportation modes and are fundamental to network-based pedestrian studies. As a result, their accessibility and connectivity are paramount not only in supporting walking, but in contributing to the overall efficiency of public transportation systems. This is particularly crucial for Asia's developing cities that have invested heavily in mass transport to alleviate the issues caused by rapid rates of growth and motorisation. Despite this fact, street centreline networks have been the default choice when calculating accessibility, connectivity, and analysing the relationship between the built environment and walking.

The vast majority of research investigating the suitability of pedestrian networks over street networks has focused on conventional approaches to accessibility and connectivity. Recent studies have shown that centrality approaches derived from urban street networks are capable of explaining a significant proportion of pedestrian activity. Presently, centrality approaches are rarely applied to dedicated pedestrian networks (DPNs). This creates uncertainty regarding their ability to explain pedestrian activity when derived from networks that better reflect pedestrian movement patterns. This study addresses that gap by placing the DPN at the centre of analysis. Its purpose is to (1): clarify the impact of network centrality, walking path characteristics, and built environment variables on segment-level pedestrian density in Asian station environments; (2) clarify the structural relationships between these factors to ascertain their total effects on pedestrian density; and (3) understand how these structural relationships vary according to the level of development in each pedestrian environment.

DPNs were created centred on metro stations in Bangkok, Manila, Osaka, Taipei and Tokyo – selected to reflect environments at different levels of development. Structural equation models consisting of accessibility and path quality latent constructs were evaluated in conjunction with directly observed centrality variables. Reviewing the standardised total effects of each latent construct, it is revealed that accessibility has a far higher impact on pedestrian density than path quality. Importantly, the standardised total effects of path quality and centrality variables is higher in the more developed environments of Osaka and Tokyo. Multigroup analyses was conducted grouping target cities into lower and higher developed pedestrian environment groups. Chi-squared difference test results reveal that the differences observed in structural relationships is statistically significant based on the level of development in the pedestrian environment.

This research is intended to provide clarity on the potential of applying centrality measures to DPNs. These measures help us to understand how people move and interact with the pedestrian environment. This can inform practitioners in designing cities that better accommodate pedestrian movement patterns. Furthermore, it is intended that the findings in this study enhance practitioner understanding of how to promote pedestrian-friendly environments by determining which factors are most central in promoting pedestrian activity in pedestrian environments at different levels of development. Ultimately, it is hoped that this research will encourage researchers to employ DPNs over street network representations in all manner of pedestrian-oriented studies. Finally, both quantitative and qualitative approaches are employed to analyse data collected through field surveys and online sources, including crowdsourced OpenStreetMap network and point of interest (POI) data. This data and approach are likely to prove useful in the context of developing cities where land use and network data is often limited.

Keywords: Pedestrian Networks, Network Centrality, Urban Network Analysis, Walkability, Accessibility, Pedestrian Density, Structural Equation Modelling, Asian Cities

List of Abbreviations

DPN: Dedicated Pedestrian Network
FPFN: Formal Pedestrian Facilities Network
GWI: Global Walkability Index
HDI: Human Development Index
OSM: OpenStreetMap
POI: Point of Interest
RWN: Real Walkable Network
SEM: Structural Equation Modelling
UITP: International Association of Public Transport
UN: United Nations
UNA: Urban Network Analysis

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Daniel Martin Pearce

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Chapter 1: Introduction

1.1. Research Context

Throughout the world, cities are being confronted with increasing environmental, economic and social challenges that have been attributed to a car-oriented approach to urban planning and design [1], [2]. An increasing reliance on personal vehicles have intensified these challenges further [3]. Nowhere, are the effects felt more than in Asia's large cities that have experienced rapid rates of growth and motorisation to become characterised by severe levels of congestion, pollution, and a deterioration in their pedestrian environments [4]. The cure commonly touted is to encourage walking over private vehicles by creating pedestrian-friendly environments and investing in public transportation [5], [6].

Many Asian cities have already gone the path of investing heavily in mass public transportation systems, and several cities including Dhaka, Jakarta and Hanoi, are currently in the process of doing so (Figure 1-1). However, since every trip begins and ends on foot, walking plays an important role in contributing to the overall efficiency of transportation networks enabling multi-modal trips, and by implication, urban accessibility and sustainability [7]. Thus, in order for walking to support transportation investments, clear and connected walking paths are imperative. Furthermore, the provision of pedestrian facilities is often neglected in developing cities despite the unquestionable importance of the pedestrian. Pedestrians are vulnerable and inadequate facilities can bring pedestrians into conflict with vehicles on the roadway, parked vehicles, and other roadside activities [8].

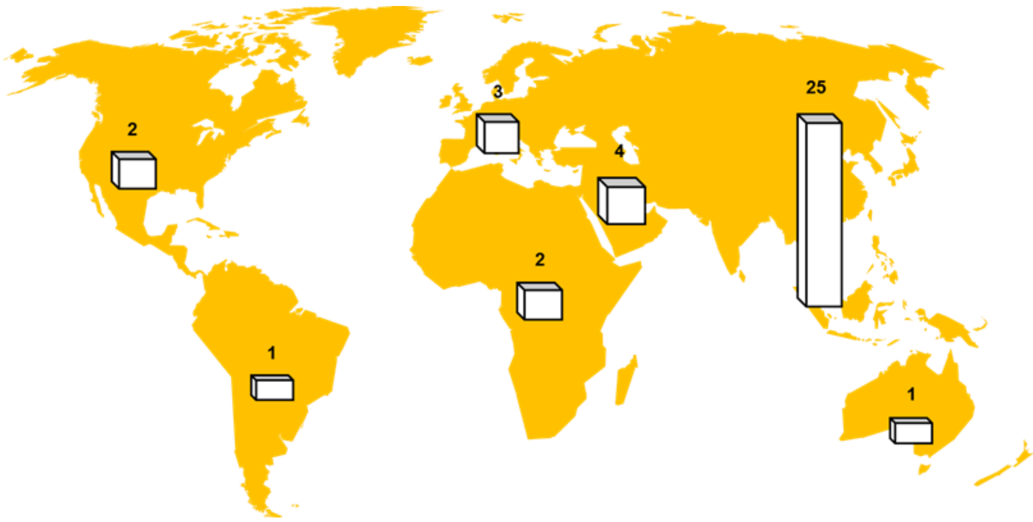

Figure 1-1. Global metro projects under construction as of 2018 (Source: UITP).

Despite the investments being made, there is evidence that walking environments remain poor around newly developed metro stations in developing cities negatively affecting accessibility. Moreover, it is believed that built environments vary internationally. For example, in highly developed cities such as Tokyo and Seoul, pedestrian environments in and around stations are excellent. In contrast, in developing cities such as Jakarta, pedestrian environments in and around stations are considered poorer. Walking paths are often few and far between, and where they are provided, they are often far too narrow, and clogged with motorcycles and street vendors [9]. This is believed to negatively affect ridership, seriously undermining public transportation investments in developing Asia cities [10]-[13]. Therefore, the relationship between the pedestrian walking environment and pedestrian activity – focusing on accessibility and path conditions, is clearly of interest and merits further investigation.

Pedestrians interact with the environment through a complex network of exclusive and shared paths that comprise the pedestrian network. These networks tie together all transportation modes and are fundamental to network-based pedestrian studies [14]. As a result, their accessibility and connectivity are paramount not only in supporting walking, but in contributing to the overall efficiency of public transportation systems. Despite this fact, street centreline networks have instead been the default choice when calculating accessibility and connectivity, and analysing the relationship between the built environment and walking [15].

Recent studies exploring the applicability of pedestrian networks suggest that they better represent how we interact with the built environment [14]-[18]. While street networks have performed well as proxies for pedestrian networks in most scenarios, studies conducting direct comparisons between accessibility and connectivity measures derived from both street and pedestrian networks have yielded mixed results. These studies argue that relying on street networks leads to distortions of reality, particularly regarding distance and route choice. For example, when utilising street networks, distance-based measures of accessibility are reportedly underestimated by as much as 7% in Asian cities [15] and destination accessibility by as much as 40% in some American neighbourhoods [16]. This is not surprising considering that street networks fail to account for the finer-grained paths available to pedestrians that increase route options and directness. Additionally, non-distance-based measures of connectivity, such as the link-node-ratio, have revealed counterintuitive results when switching to pedestrian networks, suggesting that suburban areas are more connected than traditionally gridded downtown areas [16]. These findings highlight the importance of network representation and the selection of metrics in pedestrian studies.

Presently, the vast majority of research investigating the suitability of pedestrian networks over street networks has focused on conventional approaches to accessibility and connectivity. These include applying common measures such as intersection density, percentage of four-way intersections, and the link-node ratio that have been shown to correlate strongly with pedestrian activity [17]-[19]. However, many of these measures have been criticised for providing a coarse account of connectivity across a general area. Hence, areas that score high in these measures fail to account for actual network permeability, obstructions to movement, and the spatial and structural pattern of street networks that define urban areas [20], [21]. Centrality approaches address these concerns and have been increasingly applied to expand research into accessibility and connectivity [22]. These approaches consider spatial structure by quantifying the importance of network elements in terms of how central they are in relation to other network elements [23]. Studies have shown that centrality measures derived from urban street networks are capable of explaining a significant proportion of pedestrian activity in a variety of different urban settings with minimal data requirements [21], [24].

1.2. Research Scope and Objectives

Clearly, there is some debate as to the performance of accessibility and connectivity measures derived from pedestrian networks. This paper builds on existing studies by applying centrality approaches to dedicated pedestrian networks (DPNs). DPNs consist of all multi-level formal and informal pedestrian paths that pedestrians have legal access to, including sidewalks, pedestrian-only zones, shared streets, unmarked crossings, and paths through open spaces [15]. While centrality measures have been applied to street networks, they are rarely applied to DPNs. This raises questions regarding the ability of these measures to explain pedestrian activity when using DPNs.

Additionally, I argue that existing pedestrian-oriented studies that utilise pedestrian networks have been conducted in different urban contexts outside of Asia that have distinct urban morphologies and walking cultures. For example, some approaches only include pedestrian links where there are formal sidewalks or crossings [14]. While this may work well in places like the USA that has strict jaywalking laws, it is not applicable to cities in Asia where pedestrians will typically walk along or cross a street whether a sidewalk or formal crossing is present or not. Indeed, countries such as Japan maintain very walkable environments without the presence of raised sidewalks, while those in developing parts of the region may have limited pedestrian facilities or lack them altogether. Furthermore, in some parts of Southeast Asia crossing opportunities may be restricted largely to pedestrian bridges, as opposed to at-grade signalised crossings found in other parts of the world, prioritising traffic flow over pedestrian accessibility.

This study aims to clarify the relationship between pedestrian activity and influencing factors focusing on network centrality, walking path characteristics, and other key built environment variables known to influence pedestrian activity. The DPN is placed firmly at the centre of analysis. It is from this network that all variables are derived at the unit of individual walking path segments. This study compares conditions in five Asian cities selected for their status as either a highly developed, or developing city with rapid transportation infrastructure. Within each city, three sites, each centred on a metro railway station were selected based on their levels of ridership and pedestrian facilities located within the vicinity of each station. The resulting sites comprise retail-led urban environments. I conduct this research in station environments due to the large number of Asian cities that are investing in rapid transportation systems to alleviate the issues related to rapid growth and motorisation, and for the role that pedestrian environments play in supporting these investments discussed above. Finally, both quantitative and qualitative approaches are employed to analyse data collected through field surveys and online sources, including crowdsourced OpenStreetMap network and point of interest (POI) data. This data and approach are likely to prove useful in the context of developing cities where land use and network data is often limited.

The specific objectives of this study are to:

(1) Determine the proportion of pedestrian activity that can be attributed to centrality measures derived from DPNs, both alone, and when controlling for other built environment factors;
(2) Clarify the structural relationships between centrality, walking path characteristics, built environment factors and pedestrian activity utilising structural equation modelling;
(3) Understand how structural relationships vary by level of development through conducting multigroup analyses; and
(4) Expand pedestrian network research in Asia through the development of a DPN approach tailored to Asian cities.

This research is intended to provide clarity on the potential of applying centrality measures to DPNs. These measures help us to understand how people move and interact with the pedestrian environment. This can inform practitioners in designing cities that better accommodate pedestrian movement patterns. Furthermore, it is intended that the findings in this study enhance practitioner understanding of how to promote pedestrian-friendly environments by determining which factors are most central to promoting pedestrian activity in pedestrian environments at different levels of development. Ultimately, it is hoped that this research will encourage researchers to employ DPNs over street network representations in all manner of pedestrian-oriented studies.

1.3. Study Structure

This study consists of seven chapters (Figure 1-2). In the present chapter, the background and purpose of this study was introduced. In Chapter 2, previous studies related to this research are discussed and the unique contributions of this study are presented. Chapter 3 provides a profile of selected study sites and details the methodological approach taken in this study. In Chapter 4, the relationship between centrality metrics, walking path characteristics, built environment factors, and pedestrian activity is explored through multivariate regression analyses. Chapter 5 builds on those analyses by employing structural equation modelling to identify the key structural relationships that explain pedestrian activity derived from DPNs in each study city. In Chapter 6, the differences between lower and higher developed pedestrian environments are identified and compared utilising multi-group analysis. Finally, the key findings and limitations of this work are discussed, and recommendations for future research in this area are presented in Chapter 7.

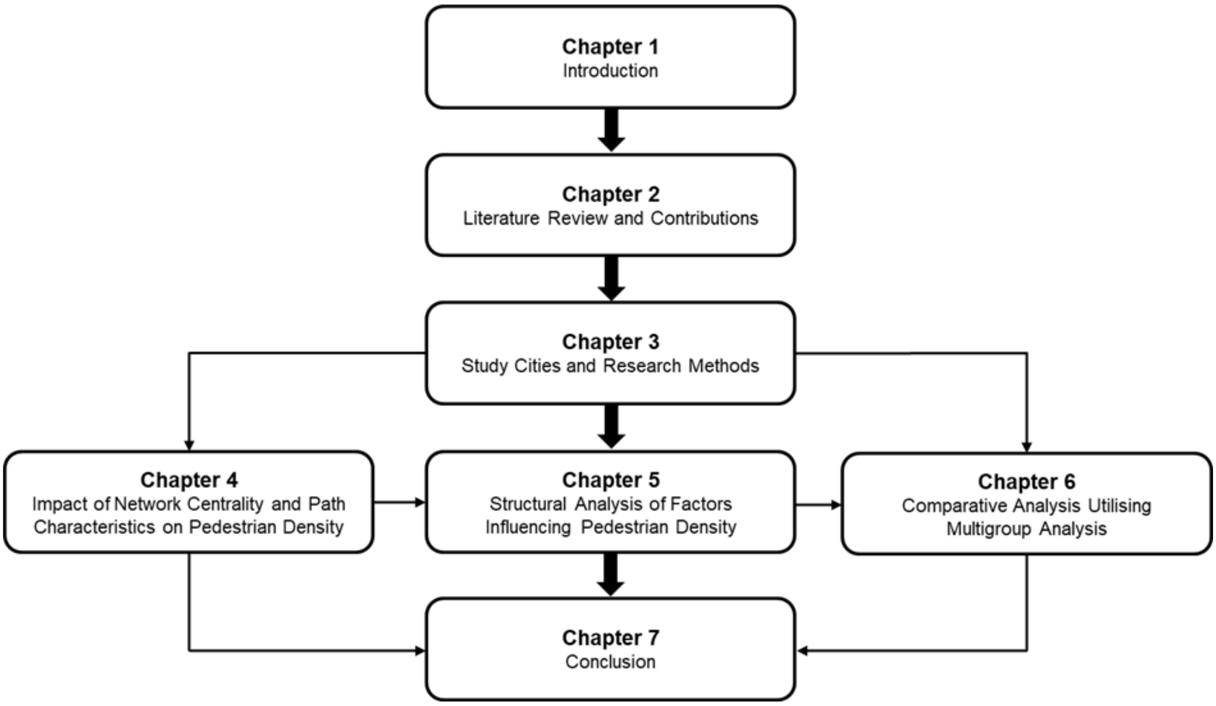

Figure 1-2. Flow diagram of this study.

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Chapter 2: Literature Review and Contributions

Promoting walking and investing in public transportation is frequently cited as a key strategy in combatting the issues that arise from a rapidly urbanising and increasingly motorised world [1], [2]. As a result, researchers have focused on better understanding the relationship between the built environment and walking in order to foster more sustainable and liveable cities [3]. This chapter overviews the relevant literature pertaining to this study. The role of the built environment in influencing walking behaviour is first discussed, before examining network centrality approaches and their application in pedestrian movement studies. The main approaches to constructing pedestrian networks undertaken in the literature are then overviewed, before finally explaining the research contributions of this study.

2.1. Built Environment and Walking

The role of the built environment in facilitating walking in well-documented. Previous studies have confirmed that built environments that exhibit high population and employment densities, land use diversity, street network design, and destination and transport accessibility, are associated with increased levels of pedestrian activity [4], [5], [11]. These factors, commonly termed the "5Ds" [11], can also be referred to as macro-scale features as they are typically measured objectively at the census block, city, or regional levels [12]. In essence, these features encourage walking through improved connectivity and accessibility. This is achieved through mixing land uses, promoting smaller block sizes, and increasing intersection and street densities, among other methods [13], [14]. This has the overall effect of increasing route options, reducing distance, and bringing destinations within closer proximity [15], [16].

Importantly, micro-scale environmental features also play a central role in promoting pedestrian activity. Common examples reported to promote walking include the presence of pedestrian amenities; sidewalk continuity and width; crossing opportunities; and aesthetic design, including the attractiveness of the environment and presence and configuration of green spaces [17]-[23]. These features are typically measured at a much finer grain either at the street or neighbourhood level, using objective or subjective methods. As such, micro-scale features encourage pedestrian activity by not only making walking more feasible and appealing to users, but relate more with individual experiences and perceptions of the built environment. Furthermore, several macro-scale features, namely street connectivity and land use diversity have also been successfully measured at the street segment level [12].

While a consensus has not been reached on the most important determinates of walking, research has consistently focused on street connectivity, and by association accessibility, suggesting it as one of the most significant factors independent of other built environment features [24]-[28]. Research has proliferated in this direction, although clear conclusions have not always emerged. This has been attributed to the coarse nature of average connectivity measures that have been applied in research, and to the collinearity between land use mix and street network design [12]. Centrality approaches address these issues through their ability to predict the proportion of pedestrian activity that can be attributed solely to the configuration of a street network, termed "natural movement" [29]. Street network configuration in turn, is said to have an indirect effect on movement by influencing land use distribution and density, that act as multipliers generating further movement [29], [30]. While natural movement does not always quantify the largest proportion of pedestrian movement, it is argued to be the most consistent and pervasive type of movement [12]. Studies conducted in various built environments bolster this theory. The following sections provide an overview of centrality approaches and applications of centrality to urban street networks in studies analysing pedestrian activity.

2.2. Network Centrality and Configurational Approaches

Centrality approaches have appeared in the urban planning and design literature under various terms, including accessibility, proximity, integration, connectivity, or cost [31]. Regardless of the term, centrality approaches quantify the importance of network elements in terms of how central they are. The concept of centrality is multifaceted with different indices available depending on what the researcher's notion is of "being central" [32]. The two most common are betweenness – a measure of the importance of an element in a network in terms of how many shortest paths pass through it [33]; and closeness – a measure of how close an element is to all other elements in a network calculated as the mean of the shortest path lengths [34]. These measures are typically encountered as choice and integration in studies that apply Space Syntax methods discussed below.

Two approaches have been applied in urban studies – those based on graph theory and Space Syntax – a theory and set of techniques that measure accessibility based on the configuration of urban spaces [35]. These approaches differ primarily in how they represent network geometry. Graph approaches employ a "primal" network representation where intersections are represented as nodes and streets as edges. Space Syntax reverses this geometry, placing streets at the centre of the analysis, creating a "dual" network representation [31]. This has traditionally resulted in different units being applied when measuring distance between network elements. Primal representations are the world standard for street network datasets utilised in transportation modelling that measure accessibility in terms of distance or cost [36]. In these applications, distance is measured metrically. Conversely, dual approaches have utilised various methods to represent street networks. The most characteristic of which are axial lines, a generalisation model akin to lines of sight and thus, are a measure of visual connectivity [37]. Axial lines are used to create axial maps where accessibility is measured in the number of topological "steps", or connections, network elements are away from each other [24]. In recent years, Space Syntax has expanded to segmental analysis of either axial lines or GIS street networks, enabling the opportunity to measure distance between segments topologically, metrically, and angularly [38]. Angular-segmental approaches have proven particularly effective at predicting pedestrian movement [39], [40]. Despite these advancements, topological approaches based on axial maps have remained the bedrock of Space Syntax research.

Both approaches have their pros and cons. Space Syntax offers analytical flexibility. However, numerous methods exist for generating axial lines that can introduce subjectivity into an analysis. Primal metric approaches that utilise existing standardised datasets are more objective and aid data processing.

Porta et al. [31] for example, performed centrality analyses on four 1-square mile samples of urban street systems over primal and dual graphs and found that primal approach supported more comprehensive, objective, realistic results, and a more feasible methodology for network analyses.

2.3. Centrality in Pedestrian Movement Studies

Studies have shown that street network centrality is capable of explaining a significant proportion of pedestrian activity [38], [41]. This research has largely been spearheaded by Space Syntax methods that utilise axial maps to conduct topographical analyses. The key metric in these studies is integration or closeness centrality, which has proven to be a powerful predictor of pedestrian activity. In short, these studies have shown that streets that are more "integrated" (or accessible within fewer direction changes), attract higher pedestrian numbers. For example, fundamental studies in London have found axial integration able to predict pedestrian activity in the range of 55-75% [29], [42], [43] with similar ranges also reported in other European capitals [44]. Betweenness centrality has also been shown to powerfully predict pedestrian activity with Law and Traunmueller's [41] results indicating that betweenness accounted for more than 50% of observed pedestrian movement in their London study sites.

Centrality approaches have increasingly been applied to analyse relationships with pedestrian activity at the micro or segment scale. A number of these studies have conducted multivariate analyses controlling for key built environment variables in a variety of different urban settings [12], [38], [45][48]. Utilising pedestrian snapshot data, Fang et al. [45] conducted multivariate analyses exploring the relationship between pedestrian density, integration and several built environment characteristics, including store density, the overflow ratio of store-front space, density of building entrances, building height, and store distance from block entrances within a mixed-use historic neighbourhood in Shanghai. Their results showed the power of network structure in explaining observed pedestrian movement densities within local small-scale neighbourhoods that are more reminiscent of pedestrian paths. Among the four statistically significant variables, integration and store density were the largest predictors, explaining 35% and 27% of observed pedestrian densities, respectively.

Though centrality is positively associated with increased pedestrian activity, it is not always the most dominant factor. Recent research by Özbil et al. [12] further analysed the association between street network centrality in conjunction with land-use and street-level design variables such as sidewalk width, and pedestrian flows in four Istanbul neighbourhoods. Separate multivariate models were constructed to better control for the effects of built environment variables. Their results indicated that network connectivity, measured with integration and directional reach, is a significant predictor of pedestrian activity. However, across all study sites the most significant predictor was accessibility to different ground-floor land uses that alone accounted for 38% of the variation in pedestrian densities. Importantly, although integration was not always significant, with the exception Küçükçekmece, the introduction of centrality measures added 12-20% to the predictive power of their models. Özer and Kubat [48] reported similar results between the number of commercial and service land uses, integration, and pedestrian activity in a separate study conducted in Istanbul.

2.4. Pedestrian Networks

In pedestrian studies addressing accessibility and connectivity, the street network has frequently been used as a proxy for actual pedestrian networks. The most common approach is based on street centrelines where intersections are represented as nodes and street segments as edges. This has proved popular due to the wide availability of standardised street centreline datasets that are easily employed in geographic information systems [2]. A variation on this approach is found in Space Syntax axial line maps. These differ in their ability to represent several street segments being more akin to lines of sight. Axial maps represent pedestrian networks in a simplified manner and have been used to represent pedestrian only paths, including in studies conducted in Asia [45]-[49]. However, a generalised street network still comprises the vast majority of these networks and rarely do they incorporate pedestrian infrastructure.

Whereas standardised street centreline data exists, pedestrian network data has remained relatively underdeveloped. Four specific approaches to representing missing pedestrian network data are identified in the literature. Firstly, Chin et al. [50] created their pedestrian network by adding in missing pedestrian data, namely paths connecting dead ends and crossing parks to the existing street network in Perth, Australia. This is the simplest approach encountered in the literature, where despite the presence of sidewalks, the pedestrian network is only ever represented by a single link running down the centre of a street right-of-way. Tal and Handy [51] refined this approach by firstly removing streets deemed inaccessible to pedestrians and then adding the large network of multi-use paths to the existing street network of Davis, California. Paths through shopping centres and redundant paths designed primarily for leisure in open spaces were also included. Interestingly, the authors modelled their network to minimise the number of nodes at intersections, representing arterial streets as single links. Both of these approaches emphasise simplicity when constructing a network in GIS resulting in significant time savings, but do not reflect the actual locations where pedestrians walk, impacting metrics that rely on distance and angle.

A third approach by Ellis et al. [52] created a standalone pedestrian network in Belfast, Northern Ireland termed the “Real Walkable Network” (RWN). This approach included both sidewalks and informal facilities such as paths through open spaces, and modelled crossings at all instances where links intersected at streets. Thus, crossings were assumed whether they were formally designated or not. However, formal or marked crossings were not modelled due to missing data. Finally, a different approach to representing the pedestrian network was undertaken by Zhang and Zhang [2]. Like Ellis et al. [52], the authors constructed standalone pedestrian networks in a variety of cities in the USA described as “Formal Pedestrian Facilities Networks” (FPFN). The FPFN consists solely of formal pedestrian facilities, namely sidewalks and designated crossings. Both the RWN and FPFN approaches differ from previous studies by preserving distance, angle, and node count by being geographically accurate.

These four approaches all require some form of manual digitisation, which is a time-consuming task requiring extensive verification to ensure data accuracy. Fortunately, developments in machine learning, image processing, and collaborative mapping have increased the availability of more detailed pedestrian networks allowing for more comprehensive analyses [53], [54]. Recent studies have also begun exploring the application of 3D pedestrian networks that utilise CAD and GIS data in high density environments, such as central Hong Kong with moderate success [55]. Among these, the collaborative OpenStreetMap (OSM) project is increasingly being used as a source of pedestrian data that represents pedestrian specific paths, including sidewalks, trails, and pedestrian bridges into its network dataset [56]. OSM data is not without issues. Some cities have more complete data than others and the integration of open spaces, typically represented as enclosed areas, has been the focus of research to provide more realistic pedestrian routes [57]. Nevertheless, it has been successfully applied in all manner of studies, including in multimodal network accessibility analyses [58]. In these applications, however, a true pedestrian network is typically not the sole analytical focus and missing pedestrian data such as sidewalks are not always accounted for.

2.5. Research Contributions

The literature is clear that centrality measures derived from urban street networks are capable of explaining a substantial proportion of pedestrian activity. While these networks have performed well as a proxy for pedestrian networks, they fail to account for all paths available to pedestrians. To rectify this, some researchers have introduced missing pedestrian data to these networks. In these applications, however, a generalised street network still takes precedence over dedicated pedestrian infrastructure. Accordingly, researchers have begun exploring the applicability of standalone pedestrian networks. In studies that directly compare accessibility and connectivity calculated on both pedestrian and street networks, substantial differences are reported with generally higher values observed in pedestrian networks. Additionally, studies verifying the validity of pedestrian networks using pedestrian data is minimal. Several studies have begun exploring the relationship between pedestrian network connectivity and levels of physical activity with mixed results [52], [59]. Yet, there are minimal cases of centrality being applied to true pedestrian networks [32], [60].

This study addresses that gap by investigating the extent to which centrality metrics derived from dedicated pedestrian networks (DPNs) can explain observed pedestrian densities, both alone, and when controlling for other built environment variables in metro station environments in Asia. Through the application of multivariate regression analyses and structural equation modelling, this study seeks to clarify the structural relationships between these factors to ascertain their total impact on pedestrian density. Finally, these relationships are reviewed by comparing results based on the respective level of development in each target city's pedestrian environment by employing multigroup analysis. This will shine line on the applicability of key variables of interest when derived from DPNs in different environments. Finally, this study is conducted in Asian cities where pedestrian network research conducted in English is less developed and street networks have largely substituted for true pedestrian networks.

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Chapter 3: Study Cities and Research Methodology

This chapter overviews study sites and the methodological approach of this study. It begins by introducing the selection process for choosing target cities and study sites. Each study site is then briefly described before overviewing the pedestrian network modelling approach. Finally, the data collection procedures for achieving the stated research objectives are introduced and the individual factors analysed in this study are detailed.

3.1. Selection of Target Cities and Study Sites

Five target cities were selected from a list of 35 candidate cities (Appendix A). Candidate cities qualified by meeting three simple conditions: 1) have a population greater than 1 million; 2) have a rapid metro system with more than 20 stations in operation; and 3) be determined safe to visit by the UK and Japanese Governments – assessed by reviewing each respective government's travel advisory warnings.

After ensuring data availability, the target cities selected were Bangkok, Manila, Osaka, Taipei and Tokyo (Figure 3-1). These cities were chosen to represent a variety of urban forms at various levels of urban development for comparative purposes. This was determined with the UN Human Development Index (HDI) that ranks countries based on per capita income, education, and life expectancy [1]. This was used to select lower and higher developed cities. Bangkok and Manila were selected owing to lower HDI scores of 0.755 and 0.699, while Taipei was selected due to its higher HDI score of 0.907, and Osaka and Tokyo due to their score of 0.909.

Figure 3-1. Map of target cities.

Each study site consists of a 400m Euclidean DPN centred on a major metro station, corresponding to a 5-minute walking catchment. A total of 15 stations were selected for analysis – three stations per target city. These were selected from a larger list of 553 candidate stations (Appendix B). To qualify candidate cities had to meet four simple conditions: 1) not serve a special purpose or have unique features including airports, ports, warehousing or logistics facilities within their 400m buffers; 2) contain no major parks, stadiums, lakes or other water surfaces, beaches, military institutions, or rail yards that exceed over 15% of the site; 3) contain no slum neighbourhoods that may be unsafe or difficult to survey; and 4) have no major construction planned during the surveying period that would hinder pedestrian movement patterns.

After ensuring data availability, the final study sites were selected by combining normalised ridership data and OpenStreetMap (OSM) point of interest (POI) data within each 400m candidate station area [2]. In each city, the station located at the 99^{th}, 90^{th} and 75^{th} percentile was chosen. The following stations were selected: Bangkok – Sukhumvit, Sala Daeng, and Chong Nonsi; Manila – Carriedo, Pedro Gil, and Roosevelt; Osaka – Namba, Tsuruhashi, and Tanimachi-Yonchome; Taipei – Songjiang-Nanjing, Zhongxiao-Fuxing, and Xinyi Anhe; and Tokyo – Ikebukuro, Nakano, and Akasaka. The characteristics of each study site is profiled in the following section.

3.2. Profile of Study Sites

The selected station study sites represent retail-led urban centres and were selected due to their high levels of ridership and pedestrian amenities (Table 3-1). In the following sections the characteristics of each target city's study sites are described. Further detail will be provided in Chapter 4.

3.2.1. Bangkok

In general, Bangkok study sites consist of a mixture of sidewalks, shared paths, and pedestrian walkways that provide limited crossing opportunities across major thoroughfares. Indeed, it is in Bangkok where elevated pedestrian walkways were most frequently encountered. In terms of the quality of Bangkok's pedestrian environment, it is not uncommon to encounter uneven sidewalks, frequent kerb cuts, long blocks, and sidewalks being used for moped taxis, making walking difficult in several locations. A relatively high number of paths surveyed also had numerous obstructions in the middle paths. This, together with shared streets that often have high volume traffic, contribute to a pedestrian environment that is good in patches, but poor in others with pedestrians frequently interacting with motorised modes. Focusing on each site, Sukhumvit has the least dense pedestrian network of any study site. It is characterised by long blocks and cul-de-sacs, and is dominated by major arterial streets running north-south and east-west through the site. The remaining sites are far more connected with Sala Daeng exhibiting a more pedestrian-friendly retail environment, due to its status as a major nightlife attraction.

Table 3-1. Pedestrian network characteristics (400m).

City	Study Sites	Network Form	Pedestrian Network		
			Length (m)	Links	Nodes
Bangkok	Sukhumvit	Broken Grid	11,699	203	127
	Sala Daeng	Broken Grid	13,238	316	206
	Chong Nonsi	Broken Grid	11,571	227	149
Manila	Carriedo	Deformed Grid	18,507	438	239
	Pedro Gil	Regular Grid	16,669	325	164
	Roosevelt	Curvilinear	17,083	391	207
Osaka	Namba	Dense Irregular Grid	27,918	873	495
	Tsuruhashi	Dense Deformed Grid	22,556	696	424
	Tanimachi-Yonchome	Regular Grid	17,100	425	238
Taipei	Songjiang-Nanjing	Regular Grid	21,174	569	312
	Zhongxiao-Fuxing	Irregular Grid	23,857	726	414
	Xinyi Anhe	Irregular Grid	21,637	626	365
Tokyo	Ikebukuro	Dense Irregular Grid	26,193	896	516
	Nakano	Dense Deformed Grid	18,339	512	314
	Akasaka	Dense Deformed Grid	20,656	575	337

3.2.2. Manila

The Manila study sites are each unique in their own way and differ far greatly to each other than other target cities. Firstly, Carriedo is located in a historic part of the city and constitutes a deformed grid of varying block sizes. The area is dominated by a sprawling market east of the station. Sidewalks are present throughout the area, but are usually of poor quality and are frequently blocked, causing pedestrians to mix with traffic. These poor path conditions are a feature of all Manila sites where the conditions were the worst of all target cities, and pedestrians walking in the road is the norm. Pedro Gil differs as its pedestrian network is more uniformly gridded consisting of streets lined by sidewalks on both sides. Finally, the Roosevelt site consists similarly of mostly poor-quality sidewalks, but is differentiated by its curvilinear network pattern dominated by a major east-west arterial road. Additionally, it has the highest proportion of residential streets of the Manila sites.

3.2.3. Osaka

On the whole, the Osaka study sites comprise the densest environments and are highly pedestrianised in nature. Namba is a major commercial and entertainment area dominated by retail land uses. It is the densest and most complex pedestrian environment in this study, consisting of shorter blocks, public spaces, pedestrian arcades, and a large network of sub-surface paths. Major streets are lined with sidewalks while narrow streets are typically shared. Tsuruhashi is similar in many ways consisting of a large number of pedestrian arcades and shared streets. This area is locally known as a historic Korean neighbourhood and is also defined by a high number of streets lined with single-family homes that are located in relative proximity to the station. Finally, Tanimachi-Yonchome is the most unique of the Osaka study sites. No arcades or pedestrian zones are present, and the area serves primarily as a business area.

3.2.4. Taipei

The pedestrian environments of Taipei are remarkably similar to each other. All Taipei study sites represent a regular gridded network of rectangular block sizes. Similar to Osaka, the pedestrian networks are dense and are characterised by sidewalks that line major streets and a fine-grained network of narrow shared streets punctuated by public spaces. These public spaces that take the form of small parks and squares are a unique feature of Taipei's study sites together with the widest sidewalks observed of all target cities. Notably, there were very few pedestrian zones or arcades encountered in any site.

3.2.5. Tokyo

Tokyo study sites are relatively dense with deformed or irregular gridded network patterns. All sites are fairly pedestrianised in nature. However, there are subtle differences in land use patterns. Ikebukuro is a major commercial and entertainment area that shares many similarities to the Namba site in Osaka. It is dominated by retail land uses and after Namba, is the second densest pedestrian environment in this study consisting of shorter blocks, public spaces, pedestrianised zones, and a large network of sub-surface paths. Major streets are lined with sidewalks while narrow streets are typically shared. Additionally, the site is characterised by the large station building that divides the area in two, with access provided to both sides mainly via the station building. The Nakano study site is characterised by a large pedestrianised area north of the station with a long arcade running north-south. This site is also characterised by greater residential land uses in locations further from the station. Finally, while there are several pedestrianised zones within the study site, Akasaka is notable for serving primarily as a business area, and has large blocks with curved streets close to the centre of the study site, affecting accessibility.

3.3.Dedicated Pedestrian Networks

OSM network data were used to construct geographically accurate DPNs [2]. DPNs are primal networks that consist of all multi-level formal and informal pedestrian facilities that pedestrians have legal access to. Pedestrian paths are modelled even in the absence of delineating kerbs or painted lines that are typically found in many Asian cities. Thus, DPNs consist of but are not limited to: sidewalks, pedestrian-only zones, shared streets, unmarked crossings, and paths through open spaces.

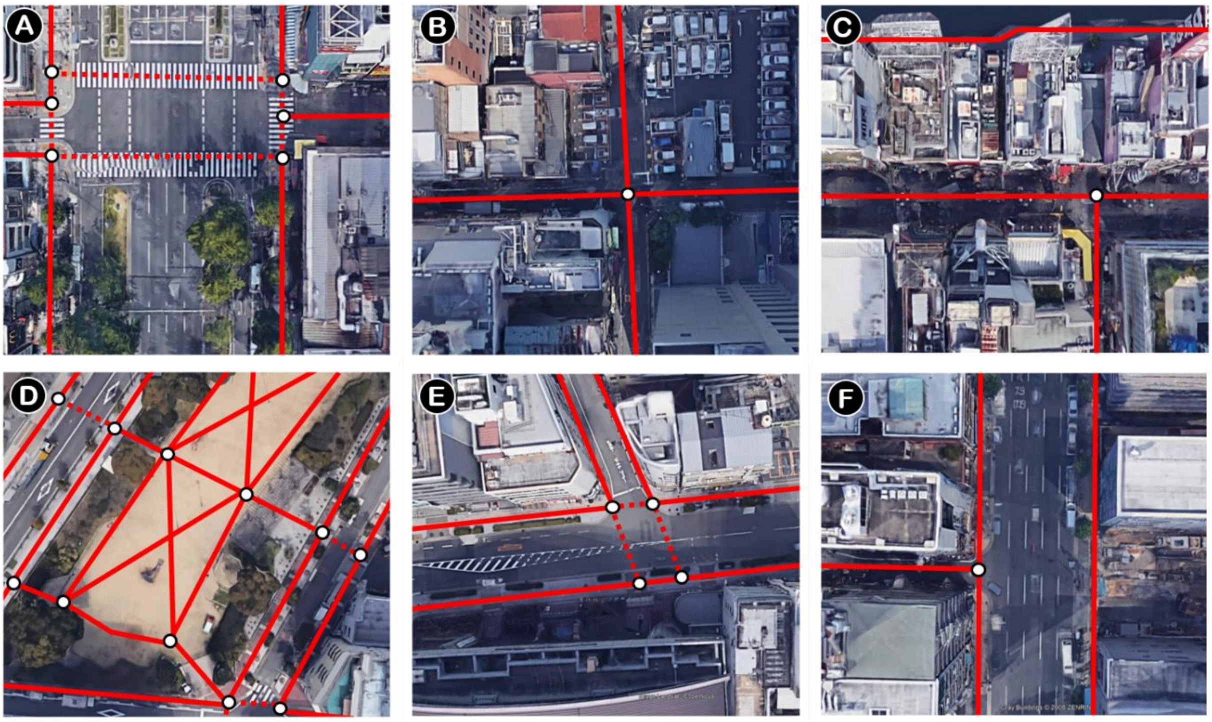
Network data were cross-referenced with aerial and satellite imagery provided by national agencies or Google Earth services to ensure the existence of each network link. Missing pedestrian links identified during this process were manually digitised in ArcGIS 10.7 according to the network principles detailed by Pearce et al. [3] discussed in the following section. These principles were employed to minimise errors when digitising pedestrian paths to ensure accuracy. Errors were further minimised by quality assurance checks and running network connectivity tools within ArcGIS. These methods overcome errors inherent in digitising spatial data and are reported to guarantee accurate networks for spatial analyses [4]. Further verification took place during field visits conducted during

October to December 2019 to confirm the existence and correctness of network links. Finally, each network was used to create a Network Dataset using the ArcGIS Network Analyst extension.

3.3.1. Network Principles

The following network principles were designed to guide the DPN construction process. These principles are intended to be a simple reference tool with the express goal of reducing errors and promoting consistency when digitising DPNs in multiple study sites and are discussed herein.

One of the biggest questions that arises when constructing a pedestrian network is whether one or two paths should be modelled along a street. Single pedestrian links were modelled for all formal pedestrian facilities such as sidewalks and crossings (Figure 3-2 – A). In the absence of physical infrastructure, a judgment is required on how wide a paved roadway ought to be to merit two separate pedestrian paths. This study employs a simple design rule for instances when no physical infrastructure is present. Single pedestrian links are modelled on shared streets, unless streets are wider than 8m, in which case, a separate link is modelled on either side of the roadway (Figure 3-2 – B). Pedestrian exclusive paths such as pedestrian zones are always modelled as a single line (Figure 3-2 – C). Pedestrian paths in large open spaces, including perimeter and redundant paths are modelled if they are observable in aerial imagery, appear in Google or OpenStreetMap basemaps, or were observed during field visits. If paths are not observable using these methods, paths are created connecting entries and exits to the public space accounting for deviations around obstacles (Figure 3-2 – D).



A. Sidewalks and formal crossings; B. Single pedestrian link on shared narrow streets; C. Pedestrian exclusive zone; D. Paths located in open spaces; E. Informal crossing opportunities; F. Informal crossing not possible.

Figure 3-2. DPN network principles.

Formal crossings are modelled at all marked locations and locations connecting two pedestrian paths at street corners. Informal crossing opportunities are modelled where all pedestrian paths intersect at streets (Figure 3-2 – E). This is similar to the RWN approach [4] but adds a restriction that informal crossings cannot span more than four lanes of traffic without a crossing aid, such as a pedestrian refuge island (Figure 3-2 – F). This additional caveat better reflects pedestrian crossing patterns observed during field visits to each study area where high traffic volumes make it difficult to cross wide streets. Fences, barriers and signage prohibiting crossings were considered in determining if crossing opportunities were possible. This approach strives to be geographically accurate and representative of crossing behaviour. All study site DPNs are shown in Appendices C to G.

3.4. Data Collection Procedures

Data collection procedures consisted primarily of in-field surveys conducted to each study site and standard desk-based methods. In this section, the survey components will be discussed in detail and the study variables they were designed to record referenced. Individual study variables will be detailed in following section.

3.4.1. Pedestrian Observation and Environmental Survey

Proportionate stratified random sampling was utilised to select pedestrian segments for data collection within each 400m study site. This ensured that all areas of a site were observed, but focused mainly on the core of each area. Approximately 75-100 pedestrian segments were surveyed in each site. Pedestrian counts were recorded during field surveys to each study site conducted during October to December 2019. Field surveys were conducted on weekdays during two periods: Morning (7am-9am) and Midday (11am-1pm).

Pedestrian counts were obtained using the “snapshot” method, a technique that involves photographing the number of pedestrians on each segment at a given moment [5], [6]. Photographs were taken approximately 10-15m apart with the same section of each segment captured twice as shown in Figure 3-3. In simple terms, in photograph 1 a section is captured and then is captured from the reverse direction in photograph 2 after advancing along the segment 10-15m. The count for each section was then averaged between the two photographs and this was continued until the entire segment was covered. Total pedestrian counts recorded on surveyed segments were then relativised by dividing by the segment’s length and multiplying by 100 to give a measure of how many pedestrians were encountered per 100m of network [8]. This relativised pedestrian density serves as the dependent variable in this study. In addition to recording pedestrians, mean path widths were also recorded using a digital laser measuring tool. Finally, photographic data obtained was used in conjunction with a Walking Path Characteristic Survey discussed in the following section.

Figure 3-3. Pedestrian photographic snap-shot method.

Table 3-2 reports segment-level pedestrian densities for all study sites. Focusing on the daily average, the highest total of observed pedestrians was recorded in Manila – Carriedo (2,962), Osaka – Namba (2,172), and Bangkok – Sala Daeng (2,096). In descending order, the median density of moving pedestrians per 100m for these sites is 29.22, 12.39, and 8.38 for Manila – Carriedo, Bangkok – Sala Daeng, and Osaka – Namba, respectively, while their corresponding means are 37.02, 24.09, and 21.29. Conversely, the three sites with the lowest recorded pedestrians were Taipei – Zhongxiao-Fuxing (769), Osaka – Tanimachi-Yonchome (655), and Taipei – Xinyi Anhe (641). In descending order, the median density of moving pedestrians per 100m is 5.01, 4.89, and 3.96 for Osaka – Tanimachi-Yonchome, Taipei – Zhongxiao-Fuxing, and Taipei – Xinyi Anhe, respectively, while their corresponding means are 8.74, 8.46, and 7.55.

Figure 3-4 displays the average spatial distribution of observed pedestrian densities for each study site. Although each site has its own characteristics, broad patterns can largely be observed in all study sites. Firstly, pedestrian densities are generally highest closest to metro entrances and along sidewalks lining major arterials. Good examples of this pattern are notable in Bangkok – Sukhumvit, Sala Daeng and Manila – Pedro Gil. Secondly, high pedestrian densities were observed in pedestrianised retail areas. This is best exemplified by Osaka – Namba which is characterised by pedestrian arcades that run north-south from the Namba City Shopping Mall to the Ebisu Bridge in Dotonbori; and in Bangkok – Chong Nonsi and Manila – Carriedo that have a high number of marketed streets to east of their study sites that serve as defacto pedestrianised zones. Finally, no discernable patterns were observable in any of the Taipei study sites where pedestrian densities were more evenly distributed. This is attributable to its gridded network, which provides a multiplicity of route options to pedestrians.

Table 3-2. Pedestrian density descriptive statistics.

Morning

City	Study Sites	Pedestrian Densities per 100m				
		Min	Max	Sum	Med	Mean
Bangkok	Sukhumvit	0.00	77.20	939.90	8.71	12.70
	Sala Daeng	0.00	201.39	2,060.30	9.08	23.68
	Chong Nonsi	0.00	102.84	1,178.54	7.24	15.31
Manila	Carriedo	2.56	90.51	2,374.58	24.06	29.68
	Pedro Gil	0.00	100.43	1,226.85	10.86	17.53
	Roosevelt	0.00	122.66	1,198.96	4.72	14.99
Osaka	Namba	0.00	130.29	1,751.22	6.73	17.17
	Tsuruhashi	0.00	72.98	690.35	2.31	6.90
	Tanimachi-Yonchome	0.00	50.16	627.57	5.01	8.37
Taipei	Songjiang Nanjing	0.00	75.93	816.59	4.99	9.28
	Zhongxiao-Fuxing	0.00	48.51	619.09	3.38	6.80
	Xinyi Anhe	0.00	51.17	507.76	3.81	5.97
Tokyo	Ikebukuro	0.00	125.45	1,385.38	8.83	16.30
	Nakano	0.00	92.69	986.12	6.40	12.33
	Akasaka	0.00	41.28	519.83	4.30	6.19

Midday

City	Study Sites	Pedestrian Densities per 100m				
		Min	Max	Sum	Med	Mean
Bangkok	Sukhumvit	0.00	115.37	1056.20	9.18	14.27
	Sala Daeng	0.00	135.17	2,131.83	15.02	24.50
	Chong Nonsi	0.00	89.74	1,427.13	11.80	18.53
Manila	Carriedo	1.37	259.23	3,549.10	31.39	44.36
	Pedro Gil	0.00	100.56	1,393.49	13.14	19.91
	Roosevelt	0.00	83.72	1,062.64	5.65	13.28
Osaka	Namba	1.00	284.34	2,592.53	8.18	25.42
	Tsuruhashi	0.00	117.20	882.72	3.02	8.83
	Tanimachi-Yonchome	0.00	50.12	683.33	4.82	9.11
Taipei	Songjiang Nanjing	1.73	108.82	1,572.66	11.68	17.87
	Zhongxiao-Fuxing	0.00	59.32	919.89	6.28	10.11
	Xinyi Anhe	0.00	91.49	775.14	4.58	9.12
Tokyo	Ikebukuro	0.00	194.54	2,149.37	15.78	25.29
	Nakano	0.00	151.09	1,438.61	7.58	17.98
	Akasaka	0.00	79.45	1,146.77	8.47	13.65

Table 3-2. Pedestrian density descriptive statistics (continued).

Average

City	Study Sites	Pedestrian Densities per 100m				
		Min	Max	Sum	Med	Mean
Bangkok	Sukhumvit	0.00	79.32	998.05	9.57	13.49
	Sala Daeng	0.00	148.94	2,096.06	12.39	24.09
	Chong Nonsi	0.00	72.22	1302.83	9.91	16.92
Manila	Carriedo	3.07	168.99	2,961.84	29.22	37.02
	Pedro Gil	0.36	85.76	1,310.17	13.06	18.72
	Roosevelt	0.48	103.19	1,130.80	4.70	14.14
Osaka	Namba	0.62	169.87	2,171.87	8.38	21.29
	Tsuruhashi	0.00	95.09	786.54	3.37	7.87
	Tanimachi-Yonchome	0.00	41.40	655.45	5.01	8.74
Taipei	Songjiang Nanjing	1.25	79.32	1,194.63	8.23	13.58
	Zhongxiao-Fuxing	0.00	43.79	769.49	4.89	8.46
	Xinyi Anhe	0.00	71.60	641.44	3.96	7.55
Tokyo	Ikebukuro	0.00	152.11	1,749.74	12.97	20.59
	Nakano	0.00	121.89	1,197.53	7.41	14.97
	Akasaka	0.00	51.26	833.30	6.65	9.92

3.4.2. Walking Path Characteristics Survey

A Walking Path Characteristics Survey was employed to collect variables addressing the quality of the pedestrian environment in terms of ease of movement, safety, and comfort. This tool is adapted from the Global Walkability Index (GWI) developed by Krambeck [8] for the World Bank and has been used in several studies including by the Asian Development Bank [9]. The GWI is a qualitative tool designed for ease of use and speed when surveying areas, and to be as objective as possible. This is done through the use of pictorial surveys and reference text to rate the quality of each factor in question on a 1 to 5 scale. Presently, the Walking Path Characteristics Survey is employed in this study to measure obstructions and the level of modal conflict on walking paths (Appendix H). This is done by referencing photographic data obtained during field surveys to each study site.

Figure 3-4. Spatial distribution of average observed pedestrian densities.

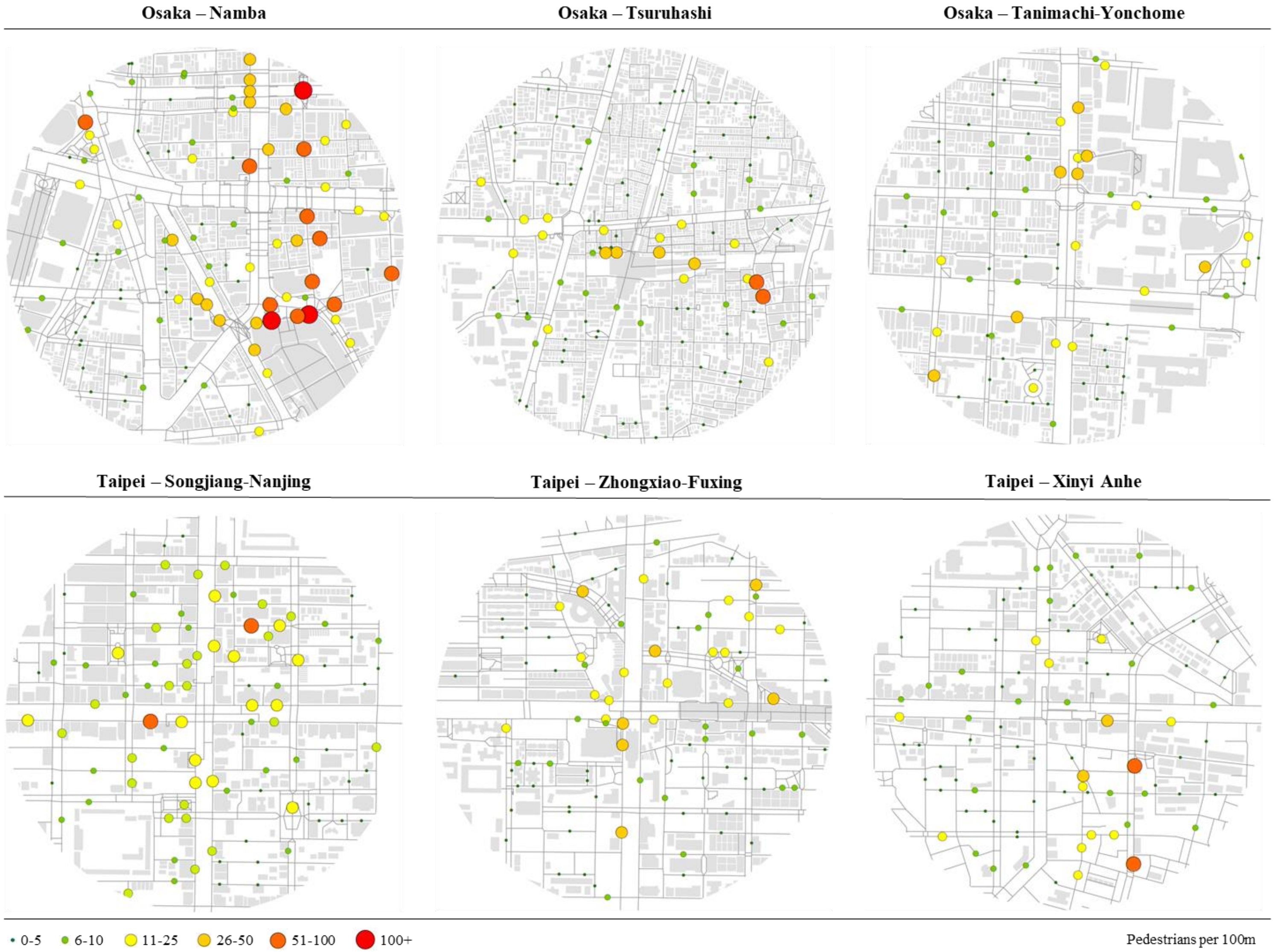


Figure 3-4. Spatial distribution of average observed pedestrian densities (continued).

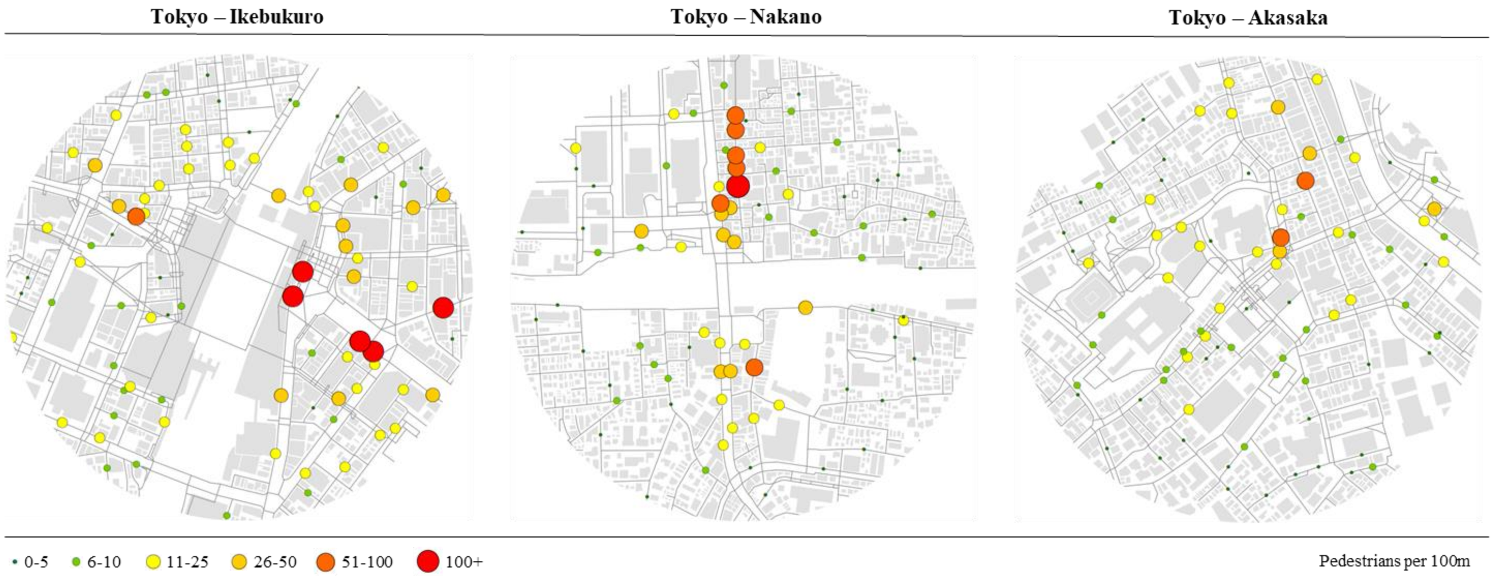


Figure 3-4. Spatial distribution of average observed pedestrian densities (continued).

3.5. Definition of Study Variables

All variables in this study are analysed at the unit of individual DPN segments, unless otherwise stated. This is important as it is at the path-level that pedestrians interact with and traverse the built environment. Both primary and secondary data were utilised in analysing the relationship between pedestrian density and key variables of interest. In total, eleven independent variables are analysed – three addressing centrality, two land use, two transportation, and four pedestrian path characteristics (Table 3-3).

Table 3-3. Independent variables measured.

Variable	Data Type	Method
Betweenness	Continuous	GIS, Urban Network Analysis
Closeness	Continuous	GIS, Urban Network Analysis
Straightness	Continuous	GIS, Urban Network Analysis
Proportion of Retail	Continuous	GIS, Photographic Survey, Google Street View
Proportion of Residential	Continuous	GIS, Photographic Survey, Google Street View
Bus Proximity	Continuous	GIS, Network Analyst
Metro Proximity	Continuous	GIS, Network Analyst
Path Width	Continuous	In field measurement
Path Exclusivity	Nominal	Photographic Survey
Modal Conflict	Ordinal	Photographic Survey, Walking Path Survey
Path Obstructions	Ordinal	Photographic Survey, Walking Path Survey

Data were obtained from OSM databases and verified through field visits. Land use data were derived from OSM point of interest (POI) data that were imported into ArcGIS 10.7 and then classified into retail, commercial, institutional, and residential land use categories. Ground floor proportional land use measures were employed due to the lack of readily available parcel-level data for all study sites. These measures are based on the number of frontages at the segment level and have been shown to be significantly correlated with pedestrian activity [5], [7]-[10]. Centrality measures were calculated locally up to a 400m radius utilising ArcGIS Network Analyst and Urban Network Analyst (UNA), an open-source toolbox used to compute centrality measures [11]. These measures were calculated on larger 800m DPNs to minimise the "edge effect" common to centrality analysis that results in analytical bias when imposing artificial network boundaries [12]. Each variable is explained in detail below.

a) *Betweenness Centrality:* measures the importance of an element in a network in terms of how many shortest paths pass through it [13]. Betweenness is interpreted as the probability that a person passes through a certain location on a network given all other possibilities. Normalised betweenness is defined by equation 1:

$$BC(i)^r = \frac{2}{(N-1)(N-2)} \sum_{j,k \in G-\{i\},\, d[j,k] \le r} \frac{n_{jk}[i]}{n_{jk}} \qquad (1)$$

where $BC(i)^r$ is the normalised betweenness of node i within search radius r; $n_{jk}[i]$ is the number of network shortest paths between nodes j and k that pass through node i; and n_{jk} is the total number of shortest paths between nodes j and k.

b) *Closeness Centrality:* measures how close an element is to all other elements in a network calculated as the mean of the shortest path lengths [14]. Closeness indicates the potential of a network location to attract movement, or in this case pedestrian activity. Normalised closeness is defined by equation 2:

$$CC(i)^r = \frac{N-1}{\sum_{j \in G-\{i\}, d[i,j] \leq r} d[i,j]} \tag{2}$$

where $CC(i)^r$ is the normalised closeness of node i within search radius r; and $d[i,j]$ is the shortest path distance between nodes i and j.

c) *Straightness Centrality:* measures how closely shortest path distances between network elements resemble their corresponding Euclidean or straight-line distances [15]. Straightness is interpreted as a measure of visual connectivity with higher values implying more direct and visible routes to destinations [16]. Normalised straightness is defined by equation 3:

$$SC(i)^r = \frac{1}{N-1} \sum_{j,k \in G-\{i\},\, d[i,j] \leq r} \frac{d_{ij}Eucl}{d_{ij}} \tag{3}$$

where $SC(i)^r$ is the normalised straightness of node i within search radius r; d_{ij}^{Eucl} is the Euclidean distance between nodes i and j; and d_{ij} is the shortest path distance between nodes i and j.

d) *Proportion of Retail:* measures the proportion of ground-floor retail land uses to the proportion of total land uses on each surveyed segment.

e) *Proportion of Residential:* measures the proportion of ground-floor residential land uses to the proportion of total land uses on each surveyed segment.

f) *Distance to Bus Stop:* the network distance from each surveyed segment to the nearest bus stop.

g) *Distance to Metro:* the network distance from each surveyed segment to the nearest metro station entrance.

h) *Path Width:* the mean width of each surveyed pedestrian path segment.

i) *Path Exclusivity:* exclusive pedestrian paths include sidewalks, arcades, pedestrian zones, walkways, and public spaces. Paths are assigned a value of 1 if exclusive or 0 if shared.

j) *Modal Conflict:* measures the level of interaction between pedestrians and other modes measured on a 1-5 scale with the Walking Path Characteristics Survey.

k) *Path Obstructions:* measures the level of obstructions pedestrian face on paths measures on a 1-5 scale with the Walking Path Characteristics Survey.

I anticipate that among all study variables, land use and transportation proximity factors will be the strongest predictors of pedestrian densities, followed by centrality and path characteristics in that order. Moreover, I hypothesise that centrality derived from DPNs will be able to explain an ample portion of pedestrian density when considered alone. However, when controlling for built environment variables, the explanatory power of centrality is likely to decrease. Furthermore, results for all variables are expected to vary depending on the form of each study site's DPN. In particular, it is anticipated that centrality and path characteristic factors will perform better in the denser and more developed pedestrian environments compared to the lower developed pedestrian environments in Southeast Asia. In other words, I believe that land use and transportation accessibility is more important in driving pedestrian activity in developing cities, where the pedestrian environment is lower quality and pedestrians walk regardless of path conditions. Finally, regarding centrality metrics, in denser pedestrian environments closeness is likely to explain a greater proportion of observed pedestrian densities consistent with literature. However, as denser environments produce greater route choices, the explanatory power of betweenness centrality is likely to decrease. Conversely, in environments with lengthy pedestrian zones, betweenness is expected to perform well.

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Chapter 4: Impact of Network Centrality and Path Characteristics on Segment-Level Pedestrian Density

In this chapter, multivariate models are employed to examine the impact of network centrality and path characteristics on segment-level pedestrian density. The purpose of this chapter is three-fold. First, to investigate the extent to which centrality metrics derived from DPNs can explain pedestrian densities, both alone, and when controlling for other built environment variables. Second, to determine the effectiveness of employing path characteristic factors in this study. Finally, to establish the foundations on which to develop the structural relationships explaining pedestrian density in Asian station environments. Thus, this phase is a necessary step to reveal the comprehensive relationships between segment-level pedestrian density and each analysed factor derived from DPNs in each site. This will inform which variables should be included in the subsequent structural equation analysis in Chapter 5.

4.1. Multivariate Regression Models

Multivariate regression models were developed for two separate scenarios analysed in the following sections. In the first scenario, each individual site is analysed alone, while in the second scenario, study sites in each city are combined to create one larger consolidated site per target city. In each case, two separate models were evaluated to analyse the impact of centrality, both alone, and in combination with other built environment variables. The two models are: *Centrality* – comprised solely of centrality metrics; and *Full Model* - which introduces all remaining built environment variables analysed in this study. This two-model approach builds on similar approaches undertaken in the literature [1], [2] and places the performance of centrality at the centre of the analysis.

At this stage of the analysis full datasets are analysed, meaning that no outliers are removed (Appendices I-M). All multivariate regression analyses were conducted with mean pedestrian density values as the dependent variable. Logarithmic transformations were applied to transform the pedestrian density variable into a normal distribution. All models satisfy key multivariate regression assumptions.

4.2. Multivariate Results: Analysis of Individual Sites

In order to better understand the distribution of pedestrians in each area, multivariate regression models were estimated by considering individual areas separately. Tables 4-1 to 4-15 demonstrate the results of regression models estimating the distribution of pedestrian densities for individual study sites. Each table reports unstandardised regression coefficients *(β),* t-test scores *(t)* used to calculate statistical significance, and standardised regression coefficients *(Std β)* for each independent variable.

4.2.1. Bangkok

Table 4-1 Bangkok – Sukhumvit: multivariate regression results.

Variable	Centrality			Full Model		
	β	*t*	*Std β*	*β*	*t*	*Std β*
Betweenness	-.80	-2.94	-.41***	-.42	-2.61	-.21**
Closeness	6.35	3.28	.45***	1.71	1.38	.12
Straightness	-.30	-.13	-.02***	2.90	1.83	.15*
Retail (prop.)				.48	.98	.13
Residential (prop.)				-1.27	-2.29	-.33**
Distance to Bus Stop				0.00	.07	.01
Distance to Metro				-.00	-2.18	-.24**
Path Width				.10	1.08	.09*
Path Exclusivity				-.50	-1.80	-.19*
Modal Conflict				.29	1.97	.21*
Path Obstructions				.26	2.08	.22**
# Observations: 74						
R-Squared		.15			.79	
Adj. R-Squared		.12			.75	

** p < 0.10; ** p < 0.05; *** p < 0.01*

Table 4 presents multivariate regression results for Bangkok – Sukhumvit. Across both models, centrality appears poor at explaining segment-level pedestrian density. Considered alone, centrality metrics account for only 12% *($p < 0.01$)* of observed pedestrian densities. While all centrality metrics enter the model as significant predictors, a closer look at their correlations with pedestrian density reveal extremely weak correlations that are not significant (Appendix N). When all remaining variables are introduced into the Full Model, the model fit improves significantly to explain up to 75% *($p < 0.01$)* of observed pedestrian densities. In this model, pedestrian densities are largely explained by residential land uses and metro distance that have standardised coefficients of -0.33 and -0.24, respectively. Importantly, several path-level attributes are also significantly associated with pedestrian movement densities. Among these factors, the degree of path obstructions and modal conflict contributed strongly to the model with standardised coefficients of 0.22 and 0.21, respectively. The explanatory power of these variables can largely be attributed to network structure. As distance increases from the station, the network becomes less connected, and cul-de-sacs are common deeper into the network. In these locations, residences accumulate and lower pedestrian volumes are observed. Similarly, retail uses accumulate around the station where several large shopping centres are located and decrease with distance from the station. Interestingly, it is residential and not retail land uses that are associated with pedestrian activity. This is likely explained by their moderate collinearity and how land use is strictly separated in the study site.

Table 4-2. Bangkok – Sala Daeng: multivariate regression results.

Variable	Centrality			Full Model		
	β	*t*	*Std β*	*β*	*t*	*Std β*
Betweenness	1.18	2.96	.38***	.52	2.12	.17**
Closeness	-13.99	-3.62	-.42***	-5.86	-2.12	-.17**
Straightness	10.10	3.27	.36***	-.34	-.14	-.01
Retail (prop.)				2.41	8.11	.55***
Residential (prop.)				-2.08	-2.95	-.22***
Distance to Bus Stop				-.00	-.40	-.04
Distance to Metro				.00	1.05	.10
Path Width				.13	3.55	.23***
Path Exclusivity				.33	1.04	.09
Modal Conflict				.14	.90	.08
Path Obstructions				.43	2.81	.19***
# Observations: 87						
R-Squared		.29			.80	
Adj. R-Squared		.26			.77	

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

A more substantial relationship is revealed between centrality and segment-level pedestrian density in Sala Daeng, which is the densest site in Bangkok (Table 4-2). In all models, at least two centrality metrics are significant. Centrality alone explains a more substantial 26% *($p < 0.01$)* of observed pedestrian densities. However, it is important to note that despite closeness being the strongest contributor in this model, it is not correlated with pedestrian density, while both betweenness and straightness are somewhat correlated (Appendix N). Entering the remaining variables results in a significant increase in the explanatory power of the model. In this model, 77% *($p < 0.01$)* of pedestrian densities are explained by a variety of variables, including centrality and path-level attributes. Retail land uses are the most important factor in the model with a standardised coefficient of 0.55. Path width, residential intensity, and path obstructions also contribute strongly with standardised coefficients of 0.23, -0.22 and 0.19, respectively. Notably, betweenness is also reported to be strongly associated with pedestrian activity. The strong performance of retail land uses is expected due to this site's status as a night spot and pedestrianised area. In several locations throughout the site, street vendors are concentrated along sidewalks attracting pedestrians in high numbers. This together with a large morning market west of the station, accounts for the highest pedestrian numbers recorded of all Bangkok study sites.

Table 4-3. Bangkok – Chong Nonsi: multivariate regression results.

Variable	Centrality			Full Model		
	β	*t*	*Std β*	*β*	*t*	*Std β*
Betweenness	.32	.65	.09	.36	1.16	.11
Closeness	3.34	1.30	.17	-2.70	-1.44	-.14
Straightness	8.80	3.08	.34***	.44	.20	.02
Retail (prop.)				2.45	6.31	.56**
Residential (prop.)				-2.05	-3.21	-.31**
Distance to Bus Stop				.00	1.73	.16
Distance to Metro				0.00	.03	.00
Path Width				.23	2.25	.19**
Path Exclusivity				.48	1.27	.16
Modal Conflict				-.24	-1.24	-.18
Path Obstructions				.35	1.84	.20*
# Observations: 77						
R-Squared		.20			.74	
Adj. R-Squared		.17			.70	

** p < 0.10; ** p < 0.05; *** p < 0.01*

Table 4-3 presents multivariate regression results for Bangkok – Chong Nonsi. Focusing on centrality, we can see that centrality alone can explain 17% *($p < 0.01$)* of observed pedestrian densities. Among centrality variables, the only significant predictor of pedestrian density is straightness with a standardised coefficient of 0.34. Factoring in remaining variables results in a considerable improvement in the explanatory power of the model. However, unlike the denser network in Sala Daeng, no centrality metrics remain significant when controlling for the built environment. The Full Model explains 70% *($p < 0.01$)* of observed pedestrian densities. Once again, retail and residential land uses are the largest contributors with standardised coefficients of 0.56 and 0.31, respectively. As with Sala Daeng, path characteristics are also strongly associated with pedestrian activity. Path obstructions and path width enter the model as significant predictors of pedestrian density with standardised coefficients of 0.20 and 0.12, respectively. This station is adjacent to Sala Daeng and shares much in common with it in terms of land use. A large pedestrian market to the east of the station is largely responsible for the strong performance of retail, while interior residential streets that are lined with apartment buildings correspond strongly with low pedestrian densities. These results indicate that pedestrians in these areas orient themselves, firstly in terms of land use attributes, then in terms of path characteristics, favouring wider paths free of obstructions.

4.2.2. Manila

Table 4-4. Manila – Carriedo: multivariate regression results.

Variable	Centrality			Full Model		
	β	*t*	*Std β*	*β*	*t*	*Std β*
Betweenness	1.21	4.62	.47***	.05	.26	.02
Closeness	-3.61	-2.14	-.22**	-.16	-.18	-.01
Straightness	-2.69	-.73	-.07	-5.50	-2.73	-.15***
Retail (prop.)				1.57	7.06	.51***
Residential (prop.)				-1.05	-1.76	-.11
Distance to Bus Stop				.00	.25	.01
Distance to Metro				.00	-.83	-.05*
Path Width				.09	4.76	.32***
Path Exclusivity				.12	.96	.06
Modal Conflict				.04	.53	.05
Path Obstructions				.14	1.90	.17
# Observations: 80						
R-Squared	.23			.85		
Adj. R-Squared	.20			.83		

** $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$*

Table 4-4 presents multivariate regression results for Manila – Carriedo. Centrality metrics combine to explain up to 20% *($p < 0.01$)* of the variation in observed pedestrian densities. Both betweenness and closeness are significant contributors to the model with standardised coefficients of 0.47 and -0.22, respectively. Investigating these variables' individual correlation coefficients reveals that closeness is not significantly associated with pedestrian density, and betweenness is behind the performance of the centrality model (Appendix O). As with the Bangkok study sites, the inclusion of the remaining variables results a large increase in the explanatory power of the model. This model explains 83% *($p < 0.01$)* of observed pedestrian densities. Looking at the standardised values, the proportion of retail on each segment is the biggest driver of pedestrian activity. The most important factors are retail intensity and path width that have standardised coefficients of 0.51 and 0.32, respectively. Additionally, straightness becomes a significant predictor when interacting with these variables. However, straightness alone is not correlated with pedestrian density. It is worth noting that Carriedo is somewhat of an anomaly among study sites analysed in this research. As described earlier, a large market with wide paths stretches over a sizeable portion of the site, accounting for the strong performance of retail and path width. It was expected that betweenness would remain significant due to the network modelling approach. Market streets that tend to be long are modelled as a single line, reducing route options that would exist if they were modelled with a path on either side of the street. This increases betweenness values. This similarly explains the negative association between closeness and pedestrian density, as streets modelled with sidewalks on either side are common to the west of the station where fewer pedestrians were observed.

Table 4-5. Manila – Pedro Gil: multivariate regression results.

Variable	Centrality			Full Model		
	β	*t*	*Std β*	*β*	*t*	*Std β*
Betweenness	.99	2.60	.36***	-.39	-1.83	-.14*
Closeness	3.65	.74	.10	5.1	1.94	.14*
Straightness	-2.16	-.52	-.06	5.69	2.47	.16**
Retail (prop.)				1.49	5.51	.45***
Residential (prop.)				-.24	-.73	-.05
Distance to Bus Stop				.00	-.43	-.05
Distance to Metro				-.00	-2.29	-.22**
Path Width				.27	2.79	.26***
Path Exclusivity				-.08	-.25	-.02
Modal Conflict				.32	3.31	.34***
Path Obstructions				-.14	-1.00	-.12
# Observations: 70						
R-Squared		.19			.84	
Adj. R-Squared		.16			.81	

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Table 4-5 presents regression results for Manila – Pedro Gil. This site differs substantially from Carriedo being less pedestrian-oriented and has a pedestrian network that is characterised by exclusive sidewalks lining both sides of streets. Here, centrality alone explains a modest 16% *($p < 0.01$)* of observed pedestrian densities. The only significant metric is betweenness with a standardised coefficient of 0.36. Entering in all study variables produces a significant improvement in the model. Together all variables explain 81% *($p < 0.01$)* of observed pedestrian densities. Retail land uses are the most important factor in the model with a standardised coefficient of 0.45. Path characteristics play a more important role in explaining variations in pedestrian activity than in Carriedo. Modal conflict and path width contribute strongly to the model with standardised coefficients of 0.34 and 0.26, respectively. A moderate level of collinearity between modal conflict and path obstructions results in path obstructions not being significant. Visiting this site, it was clear that path obstructions are plentiful forcing pedestrians into the roadway. Additionally, distance to metro is also an important contributing factor. The impact of centrality metrics is somewhat muddled when controlling for the built environment, and when reviewing their individual correlations with pedestrian density, they can be viewed as ineffective and can largely be ignored (Appendix O). These results indicate that pedestrians in this area orient themselves strongly to retail land uses, favouring wide paths that are protected from interactions with other vehicles, and are drawn to transport opportunities.

Table 4-6. Manila – Roosevelt: multivariate regression results.

Variable	Centrality			Full Model		
	β	*t*	*Std β*	*β*	*t*	*Std β*
Betweenness	-.13	-.27	-.04	-.17	-.91	-.05
Closeness	2.42	.690	.10	-1.06	-.83	-.04
Straightness	-15.42	-3.73	-.41***	-.99	-.57	-.03
Retail (prop.)				2.34	7.55	.64***
Residential (prop.)				-.40	-1.59	-.12*
Distance to Bus Stop				-.00	-1.18	-.07
Distance to Metro				.00	-.63	-.04
Path Width				.22	2.22	.13***
Path Exclusivity				-.03	-.19	-.01
Modal Conflict				-.04	-.50	-.03
Path Obstructions				.19	1.91	.12**
# Observations: 80						
R-Squared		.16			.91	
Adj. R-Squared		.12			.90	

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

In Roosevelt, centrality performed the weakest among all Manila study sites (Table 4-6). Focusing on centrality, we can see that centrality alone explains a mere 12% *($p < 0.01$)* of observed pedestrian densities. Nevertheless, it is interesting to see that straightness centrality is the most significant metric in the Centrality model with a standardised coefficient of -0.40. This was anticipated as straightness is the only centrality metric with any meaningful level of correlation with pedestrian density (Appendix O). On first glance, the sign of straightness may seem counterintuitive. However, it can be attributed to how pedestrian densities are concentrated along segments that are close to the station. These segments are actually rather curved, resulting in low straightness values. Straightness is no longer significant when built environment variables are introduced into the model. The final model explains 90% *($p < 0.01$)* of observed pedestrian densities - the best result among all study sites. In this model, pedestrian densities are overwhelmingly explained by the proportion of retail land uses on each segment with a standardised coefficient of 0.64. Retail land uses are concentrated close to the station where several department stores and markets are located. Conversely, the curvilinear network pattern of the site results in an increase of residential land uses further from the centre of the site. These two factors together account for moderate collinearity with metro distance, resulting in it not being significant in the model. Finally, the next most important factors are path width and obstructions that have standardised coefficients of 0.13 and 0.12, respectively. While Roosevelt is characterised by sidewalks they are often of poor quality and are completely blocked.

4.2.3. Osaka

Table 4-7. Osaka – Namba: multivariate regression results.

Variable	Centrality			Full Model		
	β	*t*	*Std β*	*β*	*t*	*Std β*
Betweenness	.96	2.291	.23**	.79	2.74	.19***
Closeness	-8.75	-1.673	-.15*	-9.14	-2.37	-.15**
Straightness	27.40	4.768	.48***	11.07	2.30	.19***
Retail (prop.)				1.71	4.24	.33***
Residential (prop.)				-3.03	-2.94	-.19**
Distance to Bus Stop				-.00	-1.20	-.14
Distance to Metro				.00	1.05	.09
Path Width				.05	.58	.05
Path Exclusivity				-.59	-1.51	-.12
Modal Conflict				.59	1.85	.20**
Path Obstructions				.79	2.88	.24***
# Observations: 102						
R-Squared		.35			.74	
Adj. R-Squared		.33			.71	

** p < 0.10; ** p < 0.05; *** p < 0.01*

In Osaka – Namba, centrality had the strongest association with segment-level pedestrian density of all individual study sites (Table 4-7). Here, centrality measures were found to explain a relatively healthy 33% *($p < 0.01$)* of the variation in pedestrian densities – the second-best performance among all study sites. All centrality metrics enter the model as significant. Interestingly, straightness has the largest influence on pedestrian density followed by betweenness with standardised coefficients of 0.48 and 0.23, respectively. Factoring in remaining variables, results in a considerable improvement in the explanatory power of the model to now explain up to 71% *($p < 0.01$)* of observed pedestrian densities. In this model, land use variables behave as expected with retail and residential land uses being positively and negatively associated with pedestrian density. Several path-level attributes enter the model as significant contributors. The most important factors are retail, path obstructions, and modal conflict with standardised coefficients of 0.33, 0.24, and 0.20, respectively. Importantly, all centrality metrics remain significant and contribute strongly to the final model. Surprisingly, path width and exclusivity are either not significant or have the wrong direction, despite having strong individual correlations with pedestrian density (Appendix P). This is likely attributable to some collinearity between these variables. These results indicate that pedestrians orient themselves in terms of retail, path quality, and visual connectivity. The Namba site is highly pedestrianised in nature. Ground floor retail land uses are consistent throughout, and the area is characterised by numerous wide arcades and pedestrian zones that attract large numbers of shoppers. Noteworthy, is how metro distance has no significant influence on pedestrian activity. Metro station entrances are dispersed throughout the area, meaning that distances are fairly uniform, nullifying the effectiveness of this variable.

Table 4-8. Osaka – Tsuruhashi: multivariate regression results.

Variable	Centrality			Full Model		
	β	*t*	*Std β*	*β*	*t*	*Std β*
Betweenness	.79	1.17	.14	1.27	2.63	.22***
Closeness	10.62	3.23	.32***	-2.57	-.82	-.08
Straightness	18.94	3.05	.31***	3.99	.73	.07
Retail (prop.)				.89	1.31	.19
Residential (prop.)				-1.79	-3.43	-.41***
Distance to Bus Stop				.00	.41	.03
Distance to Metro				-.00	-2.77	-.27***
Path Width				-.01	-.05	-.00
Path Exclusivity				-.51	-1.51	-.15
Modal Conflict				.12	.47	.06
Path Obstructions				.29	1.12	.10
# Observations: 100						
R-Squared		.32			.69	
Adj. R-Squared		.30			.65	

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

As with Osaka – Namba, deriving centrality from DPNs in Tsuruhashi provides more encouraging results (Table 4-8). Centrality measures were found to explain as much as 30% *($p < 0.01$)* of the variation in pedestrian densities. Reviewing each individual metrics' correlation with pedestrian density, it was expected that betweenness would enter the model as a significant predictor as it has a slightly higher correlation coefficient (Appendix P). However, the drivers of this model are closeness and straightness that report standardised coefficients of 0.32 and 0.31, respectively. When all remaining variables are introduced into the Full Model, the model fit improves significantly to explain up to 65% *($p < 0.01$)* of observed pedestrian densities. In this model, pedestrian densities are largely explained by residential land uses and metro distance that have standardised coefficients of -0.41 and -0.24, respectively. Noted earlier, this site is residential heavy in nature. Residential land uses perform better at explaining pedestrian density, but there is a fair amount of collinearity with retail land uses, causing retail to be non-significant. Notably, betweenness enters the model as a significant predictor of pedestrian activity. It was hoped that betweenness would perform well as the Tsuruhashi site has several traits in common with Namba, including numerous arcades and shared streets. In contrast to Namba, though, is how pedestrian arcades consist of shorter path lengths that are not as visually connected. Additionally, it should be noted that no path-level attributes were significantly associated with pedestrian movement densities. There could be several reasons for this, including limited pedestrian data and moderate correlation with other variables.

Table 4-9. Osaka – Tanimachi-Yonchome: multivariate regression results.

Variable	Centrality			Full Model		
	β	*t*	*Std β*	*β*	*t*	*Std β*
Betweenness	1.17	3.94	.44***	.43	1.89	.16*
Closeness	-4.42	-1.80	-.20*	-2.66	-1.49	-.12
Straightness	8.65	3.25	.33***	4.97	1.98	.19**
Retail (prop.)				.73	2.38	.22**
Residential (prop.)				-.41	-.94	-.09
Distance to Bus Stop				.00	-.32	-.03
Distance to Metro				-.00	-.78	-.07
Path Width				.17	2.82	.26***
Path Exclusivity				-.35	-1.12	-.13
Modal Conflict				.48	2.38	.28**
Path Obstructions				.35	1.89	.18
# Observations: 75						
R-Squared		.29			.72	
Adj. R-Squared		.26			.68	

** p < 0.10; ** p < 0.05; *** p < 0.01*

Table 4-9 presents regression results for Osaka – Tanimachi-Yonchome. Continuing the trend for Osaka, centrality performs relatively well. Here, centrality alone explains 26% *($p < 0.01$)* of observed pedestrian densities. While all centrality metrics enter the model as significant predictors, a closer look at closeness' correlation coefficient reveals no relationship with pedestrian density (Appendix P). In this model the largest contributors are betweenness and straightness with standardised coefficients of 0.44 and 0.33, respectively. Together, all built environment variables explain 68% *($p < 0.01$)* of observed pedestrian densities. With the exception of path exclusivity, path-level characteristics enter the model as significant predictors. Modal conflict and path width perform particularly well and are the strongest predictors of pedestrian density with standardised coefficients of 0.28, and 0.22, respectively. In general, higher pedestrian densities were located on sidewalks rather than shared streets that although, are relatively low speed, bring pedestrians into greater contact with vehicles. This is the only site in which path characteristics influence pedestrian movement densities more than land use variables. This is explained by the site's status as more of a location of business rather than retail. Importantly, betweenness and straightness perform well when controlling for the built environment reporting standardised coefficients 0.19 and 0.16, respectively. The significance of these variables is largely explained by the urban form and network structure that is characterised by long straight blocks.

4.2.4. Taipei

Table 4-10. Taipei – Songjiang-Nanjing: multivariate regression results.

Variable	Centrality			Full Model		
	β	*t*	*Std β*	*β*	*t*	*Std β*
Betweenness	.70	2.19	.28**	.03	.16	.01
Closeness	-1.84	-.69	-.07	-1.59	-.85	-.06
Straightness	9.99	2.39	.30**	8.10	2.93	.25***
Retail (prop.)				1.11	5.93	.46***
Residential (prop.)				.09	.35	.03
Distance to Bus Stop				-.00	-1.17	-.08
Distance to Metro				-.00	-3.85	-.29***
Path Width				.04	2.81	.19
Path Exclusivity				.05	.36	.03
Modal Conflict				-.01	-.12	-.01
Path Obstructions				.25	1.96	.16**
# Observations: 88						
R-Squared		.25			.77	
Adj. R-Squared		.23			.74	

** $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$*

Table 4-10 presents multivariate regression results for Taipei – Songjiang-Nanjing. Focusing on centrality, we can see that centrality alone can explain up to 23% ($p < 0.01$) of observed pedestrian densities. Among centrality variables, both straightness and betweenness are significant with standardised coefficients of 0.30 and 0.28, respectively. When all variables are entered into the Full Model, the model fit improves significantly to explain up to 74% ($p < 0.01$) of observed pedestrian densities. The largest contributors to pedestrian movement densities are retail intensity and metro distance with standardised coefficients of 0.46 and -0.29, respectively. Importantly, straightness remains significant when controlling for the built environment with a standardised coefficient of 0.25. Among path-level characteristics, only path obstructions contribute to the model. However, reviewing the correlational analysis figures for this site, reveals that modal conflict, path exclusivity, and path width to be moderately correlated with pedestrian density and with each other (Appendix Q). Among all cities, Taipei has the highest mean path widths recorded due to large sidewalks fronting main streets that are retail-heavy, and close to metro station entrances. It is in these locations, in addition to the several pedestrian zones to the northeast of the site, where pedestrian densities are highest explaining the strong associations between these variables.

Table 4-11. Taipei – Zhongxiao-Fuxing: multivariate regression results.

Variable	Centrality			Full Model		
	β	*t*	*Std β*	*β*	*t*	*Std β*
Betweenness	.21	.82	.09	.11	.78	.05
Closeness	-1.66	-.75	-.08	.77	.64	.04
Straightness	11.74	3.26	.37***	-.99	-.43	-.03
Retail (prop.)				1.72	6.85	.64***
Residential (prop.)				-.40	-1.67	-.14*
Distance to Bus Stop				-.00	-.73	-.05
Distance to Metro				.00	.602	.04
Path Width				.06	2.20	.15**
Path Exclusivity				-.05	-.31	-.02
Modal Conflict				-.04	-.36	-.04
Path Obstructions				.18	1.82	.16*
# Observations: 91						
R-Squared		.16			.79	
Adj. R-Squared		.13			.76	

** p < 0.10; ** p < 0.05; *** p < 0.01*

In Taipei – Zhongxiao-Fuxing, centrality was poorly associated with pedestrians across all models (Table 4-11). Centrality metrics alone accounted for a mere 13% ($p < 0.01$) of observed pedestrian densities. The only significant metric is straightness with a standardised coefficient of 0.37. Factoring in remaining variables results in a considerable improvement in the explanatory power of the model. However, unlike Songjiang-Nanjing, no centrality metrics remain significant when controlling for the built environment. The Full Model explains up to 76% ($p < 0.01$) of segment-level pedestrian density. Typical of most sites, retail land uses are overwhelming the most important factor in explaining pedestrian activity with a standardised coefficient of 0.64. Following this, is in notable that the path-level characteristics of path with and obstructions are the next most important contributors with standardised coefficients of 0.15 and 0.16, respectively. As noted in Chapter 3, the Taipei study sites are remarkably uniform to each other consisting of large blocks lined with sidewalks fronting major arterials and shared interior streets that often have more residential land uses on them. The poor performance of centrality in these models compared to Songjiang-Nanjing may be due to their being fewer pedestrian data to work with. This is a limitation in the pedestrian data collection method. Overall, results here indicate that pedestrian orient themselves largely in terms of land use, favouring wider paths free of obstructions.

Table 4-12. Taipei – Xinyi Anhe: multivariate regression results.

Variable	Centrality			Full Model		
	β	*t*	*Std β*	*β*	*t*	*Std β*
Betweenness	.41	1.55	.18	-.12	-.63	-.05
Closeness	-1.24	-.48	-.06	3.38	1.90	.15*
Straightness	10.34	3.04	.35***	-.70	-.26	-.02
Retail (prop.)				1.45	3.95	.52**
Residential (prop.)				-.45	-1.27	-.17
Distance to Bus Stop				.00	.58	.05
Distance to Metro				.00	1.92	.17*
Path Width				.19	4.21	.38***
Path Exclusivity				-.84	-3.87	-.49***
Modal Conflict				.33	2.67	.32***
Path Obstructions				.12	1.15	.11
# Observations: 85						
R-Squared		.19			.72	
Adj. R-Squared		.16			.67	

** p < 0.10; ** p < 0.05; *** p < 0.01*

Table 4-12 presents multivariate results for Taipei – Xinyi Anhe. This site is located two stops from Zhongxiao-Fuxing and shares much in common with it in terms of the built environment and regression results. Focusing on centrality, we can see that centrality accounts for only 16% ($p < 0.01$) of observed pedestrian densities. As with the previous site, the only significant metric is straightness with a standardised coefficient of 0.37. When all variables are entered into the final model, the model fit improves to explain up to 67% ($p < 0.01$) of observed pedestrian densities. Once again, retail land uses are the most important factor in explaining pedestrian activity with a standardised coefficient 0.52. What makes this model unique, however, is the strength of the contributions of path-characteristics that perform arguably better than in other sites. In order of importance, path exclusivity, width, and modal conflict contribute the most with standardised coefficients of -0.49, 0.38 and 0.32, respectively. It should be noted, however, that the direction of path exclusivity is negative, while it is actually positively correlated with pedestrian density (Appendix Q). This is likely due once again to moderate correlations between path characteristics as these variables evaluate qualities of pedestrian paths that are closely related to each other. In short, increased pedestrian activity in this site is encouraged by wide, exclusive paths, which are typically pedestrian paths or sidewalks, that are free modal conflict. It is in these locations where retail land uses also aggregate.

4.2.5. Tokyo

Table 4-13. Tokyo – Ikebukuro: multivariate regression results.

Variable	Centrality			Full Model		
	β	*t*	*Std β*	*β*	*t*	*Std β*
Betweenness	.58	2.04	.23**	.71	3.28	.27***
Closeness	5.95	1.98	.19*	-2.05	-.80	-.07
Straightness	18.18	3.30	.35***	8.19	1.51	.16
Retail (prop.)				.45	.96	.11
Residential (prop.)				-1.61	-2.61	-.21**
Distance to Bus Stop				.00	-.23	-.02
Distance to Metro				-.00	-1.78	-.20*
Path Width				.11	3.11	.24***
Path Exclusivity				.01	.05	.00
Modal Conflict				.01	.05	.01
Path Obstructions				.54	2.46	.23***
# Observations: 85						
R-Squared		.36			.71	
Adj. R-Squared		.34			.66	

** $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$*

In Tokyo – Ikebukuro, centrality performed strongly with similar results to Osaka – Namba (Table 4-13). Centrality measures alone explain a healthy 34% *($p < 0.01$)* of the variation in pedestrian densities – the best performance among all study sites. All centrality metrics enter the model as significant. Continuing the trend observed in other sites, straightness, followed by betweenness, have the largest influence on pedestrian density with standardised coefficients of 0.35 and 0.23. Factoring in remaining variables results in a considerable improvement in the explanatory power of the model to now explain up to 66% *($p < 0.01$)* of observed pedestrian densities. In this model, betweenness remains a significant predictor of pedestrian density. Several path-level attributes enter the model as significant contributors. The most importance factors are betweenness, path width, path obstructions, and distance to metro with standardised coefficients of 0.27, 0.24, 0.23, and -0.21, respectively. Surprisingly, it is the proportion of residential land uses on each segment and not retail that is significant in the model. Moreover, path exclusivity and modal conflict are also non-significant, despite all these variables having moderate to strong individual correlations with pedestrian density (Appendix R). This is likely attributable to some collinearity between these variables, particularly retail and proximity to metro entrances. These results indicate that pedestrians orient themselves in terms of path quality, proximity to metro transit, retail, and choose paths that are influential – serving as bridges to other parts of the pedestrian network. The site is highly pedestrianised in nature. Ground floor retail land uses are consistent throughout, and the area is characterised by numerous pedestrian zones that are high quality, attracting pedestrians.

Table 4-14. Tokyo – Nakano: multivariate regression results.

Variable	Centrality			Full Model		
	β	*t*	*Std β*	*β*	*t*	*Std β*
Betweenness	.62	1.74	.19*	.50	1.76	.16*
Closeness	2.72	1.17	.14	-1.68	-.92	-.08
Straightness	12.19	3.71	.40***	4.24	1.51	.14
Retail (prop.)				.54	1.41	.16
Residential (prop.)				-.87	-1.85	-.23*
Distance to Bus Stop				-.00	-.45	-.05
Distance to Metro				-.00	-2.92	-.29***
Path Width				.21	1.86	.21*
Path Exclusivity				-.50	-1.28	-.18
Modal Conflict				-.03	-.11	-.02
Path Obstructions				.60	2.29	.22**
# Observations: 80						
R-Squared		.36			.73	
Adj. R-Squared		.33			.69	

** p < 0.10; ** p < 0.05; *** p < 0.01*

Table 4-14 presents multivariate results for Tokyo – Nakano. As with Ikebukuro, deriving centrality from DPNs provides encouraging results. Centrality measures alone account for 33% *($p < 0.01$)* of the variation in pedestrian densities. The drivers of this model are straightness and betweenness that report standardised coefficients of 0.40 and 0.19, respectively. When all remaining variables are introduced into the Full Model, the model fit improves significantly to explain up to 69% *($p < 0.01$)* of observed pedestrian densities. In this model, pedestrian densities are largely explained by metro proximity and residential land uses that have standardised coefficients of -0.29 and -0.23, respectively. Residential uses are common throughout the study site and there is high collinearity with retail land uses, causing retail to be non-significant. This same trend was observed in Osaka – Tsuruhashi that also has many residential areas. In the final model, the path-level attributes of path obstructions and path width also contribute strongly to the model with standardised coefficients of 0.22 and 0.21, respectively. Notably, betweenness remains the only significant predictor of pedestrian activity. This is in spite of straightness having a stronger individual correlation with pedestrian density (Appendix R). Relative high collinearity between straightness and land use variables appears to be the reason why straightness loses significance once all built environment variables are entered into the model.

Table 4-15. Tokyo – Akasaka: multivariate regression results.

Variable	Centrality			Full Model		
	β	*t*	*Std β*	*β*	*t*	*Std β*
Betweenness	.86	3.38	.37***	1.10	5.14	.48***
Closeness	-1.25	-.51	-.06	-8.15	-3.64	-.36***
Straightness	9.22	2.86	.29***	-.17	-.06	-.01
Retail (prop.)				.70	2.19	.21***
Residential (prop.)				-.53	-1.31	-.15
Distance to Bus Stop				-.01	-3.64	-.45***
Distance to Metro				.00	.92	.09
Path Width				.07	2.67	.21***
Path Exclusivity				-.52	-1.54	-.19
Modal Conflict				.08	.39	.05
Path Obstructions				.42	2.22	.22**
# Observations: 84						
R-Squared		.27			.69	
Adj. R-Squared		.25			.64	

** p < 0.10; ** p < 0.05; *** p < 0.01*

Table 4-15 presents regression results for Tokyo – Akasaka. Once again, centrality performs reasonably well, though not as strongly as in the other Tokyo sites. Focusing on centrality, we can see that centrality measures account for 25% *($p < 0.01$)* of observed pedestrian densities. Among centrality variables, both betweenness and straightness are significant with standardised coefficients of 0.37 and 0.29, respectively. When all variables are entered into the Full Model, the model fit improves significantly to explain up to 64% ($p < 0.01$) of observed pedestrian densities. The largest contributors to pedestrian movement densities are betweenness and proximity to bus stops with standardised coefficients of 0.48 and -0.45, respectively. The proportion of retail land uses on each segment, path width and path obstructions, also contribute strongly to the model. Interestingly, closeness centrality becomes significant in this model with a standardised coefficient of -0.36. However, reviewing its correlation with pedestrian density reveals no relationship (Appendix R). Therefore, its influence in this model can largely be ignored. In short, increased pedestrian activity in this site is encouraged by wide paths that free from obstructions, connect well to other parts of the network, and are within close proximity to bus stops. It is in these locations where retail land uses also aggregate.

4.3. Multivariate Results: Analysis of Consolidated Cities

In order to better understand the performance of variables of interest at the city-level, multivariate regression models were estimated by combining individual study sites into a consolidated city site. Thus, one site per target city was analysed to see how centrality and path characteristics perform in a larger dataset. Multivariate regression results are reported from Table 4-16 to Table 4-20. Each table reports unstandardised regression coefficients *(β),* t-test scores *(t)* used to calculate statistical significance, and standardised regression coefficients *(Std β)* for each independent variable.

4.3.1. Bangkok

Table 4-16. Bangkok (Consolidated): multivariate regression results.

Variable	Centrality			Full Model		
	β	*t*	*Std β*	*β*	*t*	*Std β*
Betweenness	.19	.85	.07	.24	1.74	.09*
Closeness	.32	.20	.02	-2.88	-2.80	-.14***
Straightness	6.15	3.68	.25***	1.42	1.23	.06
Retail (prop.)				2.16	10.59	.51***
Residential (prop.)				-.98	-2.93	-.16***
Distance to Bus Stop				.00	-.21	-.01
Distance to Metro				0.0	.17	.01
Path Width				.12	3.89	.16***
Path Exclusivity				.14	.74	.04
Modal Conflict				.09	1.00	.07
Path Obstructions				.35	3.85	.21***
# Observations: 238						
R-Squared		.83			.69	
Adj. R-Squared		.07			.68	

** p < 0.10; ** p < 0.05; *** p < 0.01*

Table 4-16 presents multivariate results for Bangkok. It is clear from the results that centrality does not perform well across both models. Centrality metrics alone account for a mere 7% ($p < 0.01$) of observed pedestrian densities across all survey locations. Straightness is the only variable of note with a standardised coefficient of 0.25. The Full Model performs well to explain 68% ($p < 0.01$) of observed pedestrian densities. In this model, pedestrian densities are largely explained by the proportion of retail land uses on each segment with a standardised coefficient of 0.51. Significantly, the walking path characteristics of path obstructions and path width remain strong contributors to pedestrian activity, as they were in most individual Bangkok sites with standardised coefficients of 0.21 and 0.16, respectively. This highlights the potential for applying path-level attributes to DPNs. Residential land uses also behave as expected being negatively associated with pedestrian density. Transport proximity variables do not contribute to the consolidated city model. This is explained by the dominance of retail areas, including markets and street vendors, where people typically gather to eat during the day. It should be noted that despite closeness being statistically significant in the final model, it should be ignored. Investigating the individual correlation coefficients of centrality variables reveals that closeness is not significantly associated pedestrian density, while betweenness and straightness are weakly correlated at best (Appendix N). Finally, although centrality performs poorly in Bangkok, it should be noted that these poor results are overwhelming affected by the poor performance of the Sukhumvit study site. It's removal from this analysis would greatly improve these results.

4.3.2. Manila

Table 4-17. Manila (Consolidated): multivariate regression results.

Variable	Centrality			Full Model		
	β	*t*	*Std β*	*β*	*t*	*Std β*
Betweenness	.94	4.09	.28***	-.10	-.99	-.03
Closeness	-5.76	-3.38	-.23***	-.96	-1.29	-.04
Straightness	-9.58	-3.97	-.25***	.21	.21	.01
Retail (prop.)				1.83	13.49	.52***
Residential (prop.)				-.92	-6.92	-.23***
Distance to Bus Stop				-.00	-3.37	-.10***
Distance to Metro				.00	-.61	-.02
Path Width				.10	5.20	.17***
Path Exclusivity				-.02	-.23	-.00
Modal Conflict				.08	1.58	.07
Path Obstructions				.11	1.85	.08*
# Observations: 230						
R-Squared	.14			.88		
Adj. R-Squared	.13			.87		

** p < 0.10; ** p < 0.05; *** p < 0.01*

In Manila, consolidated results for centrality metrics are only marginally better than those in Bangkok (Table 4-17). The centrality model explains a slightly improved 13% ($p < 0.01$) of the variation in observed pedestrian activity. While all centrality metrics enter the model as significant predictors and contribute equally to the model, a closer look at their correlations reveal that only betweenness and straightness are weakly correlated with pedestrian density (Appendix O). When controlling for the built environment, no centrality metric remains significant. Introducing the built environment variables results in a large increase in the explanatory power of the model. This model explains 87% ($p < 0.01$) of observed pedestrian densities – the best result among consolidated sites. Looking at the standardised values, the proportion of retail on each segment is biggest driver of pedestrian activity, as it was in each individual Manila site, followed by residential land uses with standardised coefficients of 0.52 and -0.23, respectively. Similar to the previous Bangkok model, path width is the third most important variable in explaining pedestrian density with a significant coefficient of 0.17. Interestingly, proximity to the nearest bus stop is significantly associated with pedestrian density, despite not being as strongly individually correlated as metro proximity. Path obstructions also contribute a small amount to the validity of this model. The consolidation of Manila sites into a single site poses a few research concerns. Namely, these sites are arguably the three most different among target cities in terms of their urban and network forms, raising concerns about whether they can be seen as a cohesive representative site for Manila.

4.3.3. Osaka

Table 4-18. Osaka (Consolidated): multivariate regression results.

Variable	Centrality			Full Model		
	β	*t*	*Std β*	*β*	*t*	*Std β*
Betweenness	1.07	4.08	.25***	.76	4.20	.18***
Closeness	2.55	1.18	.07	-2.83	-1.80	-.07*
Straightness	14.84	5.17	.30***	7.14	3.01	.14***
Retail (prop.)				1.30	5.73	.29***
Residential (prop.)				-.91	-3.25	-.17***
Distance to Bus Stop				.00	-.79	-.03
Distance to Metro				-.00	-2.21	-.11**
Path Width				.13	2.53	.12**
Path Exclusivity				-.54	-2.55	-.15**
Modal Conflict				.39	2.39	.16**
Path Obstructions				.53	3.60	.19***
# Observations: 277						
R-Squared		.24			.66	
Adj. R-Squared		.23			.65	

** p < 0.10; ** p < 0.05; *** p < 0.01*

Table 4-18 presents multivariate results for Osaka. Building on the results of individual Osaka sites, centrality metrics performed fairly well when Osaka sites are aggregated into a consolidated group. Here, centrality measures alone were found to explain 23% (p < 0.01) of the variation in pedestrian densities. Straightness and betweenness are both significantly associated with segment-level pedestrian density with standardised coefficients of .30 and 0.25, respectively. Factoring in the remaining variables, results in a considerable improvement in the explanatory power of the model to now explain up to 65% (p < 0.01) of observed pedestrian densities. This is the lowest predictive power of all Full Models among consolidated city groups. Retail land uses are the most important factor in the model, with a standardised coefficient of 0.29 – a much lower contribution when compared to Bangkok and Manila. Indeed, segment-level pedestrian density is explained more equally by a variety of factors, including centrality, path-characteristics, and proximity to metro transportation. All path-level characteristics are significant with path obstructions and modal conflict performing the strongest with standardised coefficients of 0.19 and 0.16, respectively. Betweenness is the most is important centrality metric reporting a standardised coefficient of 0.18. These results are encouraging for exploring the applicability of centrality and path quality variables in dense urban environments.

4.3.4. Taipei

Table 4-19. Taipei (Consolidated): multivariate regression results.

Variable	Centrality			Full Model		
	β	*t*	*Std β*	*β*	*t*	*Std β*
Betweenness	.51	3.13	.21***	.12	1.21	.05
Closeness	-.55	-.38	-.02	.87	.94	.04
Straightness	9.39	4.44	.29***	.16	.11	.00
Retail (prop.)				1.20	8.39	.44***
Residential (prop.)				-.61	-3.93	-.21***
Distance to Bus Stop				.00	-.57	-.02
Distance to Metro				.00	-.45	-.02
Path Width				.07	4.99	.20***
Path Exclusivity				-.20	-2.12	-.11**
Modal Conflict				.13	1.98	.11**
Path Obstructions				.15	2.28	.12**
# Observations: 266						
R-Squared		.18			.71	
Adj. R-Squared		.17			.70	

** $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$*

In Taipei, consolidated results for centrality metrics are underwhelming, but better than those observed in Bangkok and Manila (Table 4-19). When considered alone, centrality metrics are reportedly capable of explaining 17% ($p < 0.05$) of observed pedestrian densities. Both straightness and betweenness enter the model as significant predictors with standardised coefficients of 0.29 and 0.21, respectively. However, none of these measures remain significant when controlling for the remaining built environment variables. The introduction of these variables produces a significant increase in model fit to explain 70% ($p < 0.05$) of observed pedestrian densities. Full Model results suggest that the primary factors in explaining the distribution of pedestrian movement densities are the proportion of retail and residential land uses at the segment-scale, along with path characteristics that all enter the model as significant predictors. The most important factors are retail and residential land uses, path width and obstructions with standardised coefficients of 0.44, -0.21, 0.21 and 0.12, respectively. No transportation proximity variables contribute to the model.

4.3.5. Tokyo

Table 4-20. Tokyo (Consolidated): multivariate regression results.

Variable	Centrality			Full Model		
	β	*t*	*Std β*	*β*	*t*	*Std β*
Betweenness	.60	3.87	.23***	.83	7.02	.32***
Closeness	2.29	1.59	.10	-2.94	-2.62	-.12***
Straightness	13.68	6.83	.40***	1.57	.93	.05
Retail (prop.)				.87	4.45	.25***
Residential (prop.)				-.71	-2.94	-.17***
Distance to Bus Stop				-.00	-2.32	-.13**
Distance to Metro				-.00	-2.76	-.14***
Path Width				.08	3.83	.16***
Path Exclusivity				-.24	-1.29	-.08
Modal Conflict				-.01	-.10	-.01
Path Obstructions				.66	5.71	.28***
# Observations: 249						
R-Squared		.32			.68	
Adj. R-Squared		.31			.66	

** p < 0.10; ** p < 0.05; *** p < 0.01*

Table 4-20 presents multivariate results for Tokyo. Consolidated results for centrality measures are the best among all target cities. This is expected due to the stronger performance of centrality in each individual Tokyo site. Focusing on centrality measures, we can see that centrality alone can explain 31% *($p < 0.01$)* of observed pedestrian densities. Straightness and betweenness are both significantly associated with segment-level pedestrian density with standardised coefficients of 0.40 and 0.23, respectively. Similar to Osaka, it is straightness that is the most important factor in the Centrality model. Factoring in the remaining variables results in a considerable improvement in the explanatory power of the model to now explain up to 66% ($p < 0.01$) of observed pedestrian densities. The most important factors in this model are betweenness, path obstructions, and retail land uses with standardised coefficients of 0.32, 0.28, and 0.25, respectively. Both transportation proximity variables, residential land uses, and path width, also contribute to the model and are significantly associated with pedestrian density. Interestingly, when controlling for the built environment, straightness is no longer a factor in influencing pedestrian density. This fact was also observed in the consolidated Osaka model and can be explained by how straightness is moderately correlated with land use variables and several path-level characteristic variables.

4.4. Conclusion

The present chapter confirms that centrality measures derived from DPNs are associated with increased pedestrian activity. However, results vary significantly with the network and urban forms of each study site, meaning that their performance in explaining pedestrian activity needs to be approached with caution.

Results indicate that centrality alone can explain 12-34% of segment-level pedestrian density in individual station environments. When consolidating individual sites into city groups, this range drops to 7-31%. These ranges are comparatively lower than those cited in earlier Space Syntax studies that employ either axial or segmental approaches to urban street networks [2]-[5],[15]. Naturally, DPNs are far larger and complex than street centreline networks. They consist of more links and nodes, resulting in shorter distances between network elements, which in turn impacts centrality. This further varies with the complexity inherent in each urban network form. Seemingly, centrality is more strongly associated with pedestrian activity in denser gridded networks that consists of shorter paths. This is best exemplified by the weaker associations observed in Bangkok – Sukhumvit (13%, $p < 0.05$), which consists of fewer network elements with greater distances between them, and Manila – Roosevelt (13%, $p < 0.05$) that consists of a curvilinear and more suburban environment. This contrasts the better associations reported in denser gridded networks, such as Osaka – Namba (33%, $p < 0.05$) which consists of short path lengths and a fine-grained pedestrian network.

The influence of centrality is somewhat diminished when we control for the built environment. Still, excluding Bangkok, centrality remains a sizeable contributor to pedestrian activity. In line with similar street network centrality studies, the Full Models suggest that the primary factors in explaining pedestrian densities are the proportion of ground floor land uses, chiefly retail uses, proximity to transit, and path width [1],[2], [6]-[8]. Importantly, path characteristic variables performed well in most study sites, including modal conflict and path obstructions, highlighting their importance in evaluating pedestrian activity in Asian environments. Notable, however, was how path exclusivity was often not strongly associated with pedestrian activity. This is likely due to two reasons – moderate collinearity with other path variables, and the high number of shared streets within Asian cities that result in pedestrians being somewhat more used to walking within close proximity of traffic diminishing the impact of this variable.

An important consideration is the performance of individual centrality measures. Looking at our results, different metrics had stronger relationships in different sites. For example, betweenness performed well in most Manila sites, while straightness performed particularly well in Osaka sites. Existing literature points to closeness or integration as being the key metric in explaining pedestrian activity on street networks. Generally, closeness was weakly associated with pedestrian density and when an association was found, it was often negative. The performance of centrality across our target cities is a factor of two things – our network modelling approach, and the spatial variance of centralities within each study site. In DPNs that consist of long pedestrian zones and shared paths modelled as single lines, betweenness performs strongly. Conversely, in DPNs with more paths modelled on either side of a street increasing route options, the explanatory power of betweenness decreases. Unexpectedly, in denser DPNs straightness performs best due to reduced straight line distances between nodes indicating that pedestrians in these environments orient themselves strongly in terms of visual connectivity. This is best exemplified by Osaka where pedestrian activity is higher on segments that are more visually connected with director routes to destinations. These segments were typically pedestrian arcades and shopping zones where pedestrian activity was notably higher. Naturally, the spatial characteristics of variables vary within each study site, as well as between target cities. For example, segments with high betweenness values in Manila are concentrated to the east of the station and correspond strongly with pedestrian market streets. Similarly, the visually connected segments with high straightness values in Osaka were located to the northeast of the station, running in a north-south orientation. These locations, where the highest pedestrian numbers were observed, raises the question concerning whether it is the centrality of the DPN, or retail land uses that ultimately promotes pedestrian activity. The spatial variance of these variables over larger areas is an important consideration noted in other studies [9]. However, due to the relatively small size of the study sites presented in this study, the importance of this is difficult to ascertain.

It should not be ignored that study sites, where the highest volumes of pedestrians were surveyed, reported the best results for centrality. High pedestrian volumes were recorded in sites where retail land uses are more concentrated and plentiful. This may suggest some collinearity between centrality and retail land use, or ultimately that centrality is only capable of explaining pedestrian activity to a notable level in the most urban retail-heavy environments. Finally, it is worth recalling that centrality is a multifaceted concept with numerous indices available depending on how the notion of “being central” is defined [10]. This points to the importance of choosing the right metric for the environment in question. Moving forward, I intend to include betweenness and straightness centrality in combination with land use, transportation, path-level characteristics when formulating structural relationships that explain segment-level pedestrian density.

In summary, the key findings of this are summarised as follows:

- ❖ In almost all situations, centrality performs better in denser gridded environments that are comprised of wider paths with frequent intersections creating shorter segments.
- ❖ Closeness centrality performs weakly, particularly in environments that consist of streets with sidewalks lining both sides.
- ❖ A variety of different path characteristics are significant in each study site.
- ❖ Shared streets are plentiful, often affecting the performance of path exclusivity
- ❖ Retail is the most important and pervasive factor influencing pedestrian density across study sites.

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Chapter 5: Structural Analysis of Factors Influencing Pedestrian Density

Through multivariate regression analyses, Chapter 4 revealed that centrality, land use, transport proximity, and path characteristics derived from DPNs, are capable of explaining a considerable portion of segment-level pedestrian density in Asian station environments. However, the factors influencing pedestrian activity are not uniform across study sites. This is particularly true in sites that differ widely in terms of land use patterns, network forms, and path conditions. Therefore, the goal of this chapter, is to clarify the underlying importance of each factor by exploring the interactions between variables of interest and segment-level pedestrian density.

Structural equation modelling (SEM) is employed to achieve this goal. This technique has been successfully used in several studies analysing the impact of the built environment on travel behaviour including walking activity [1]-[3]. In the present chapter, structural models are constructed based on a proposed theoretical model that specifies relationships between variables using IBM Amos 28. The proposed theoretical model builds on findings established in the research literature and the hypotheses proposed in this study. A common trait of SEM is the grouping of related factors into latent constructs and the ability to test hypotheses by simultaneously estimating structural relationships between latent constructs and directly observed variables. Ultimately, the total impact of each study variable on segment-level pedestrian density can be verified. In the following sections, the key aspects of SEM are discussed in further detail and the general research hypothesis is introduced. Finally, SEM results will be presented for each target city.

5.1. Structural Equation Modelling and Research Hypothesis

Structural equation modelling (SEM) is a multivariate statistical technique that is based on a structural model representing a hypothesis about the causal relationships among various factors within observed data [5]. It can be viewed as a combination of several multivariate analytical techniques, including factor analysis, path analysis, and multivariate regression analysis. It is used to analyse structural relationships between measured variables and latent constructs.

SEM has several key characteristics that cater it well to this research [5]. First, it simultaneously estimates multiple and interrelated dependencies between measured variables and latent constructs in a single analysis. Second, it provides a modelling structure where causal relationships between measured variables and latent constructs can be hypothesised and tested. Third, it provides a visualisation of the constructs being measured and the hypothesis being tested. Finally, it allows the direct, indirect, and total effects of a variable of interest on pedestrian density to be verified. For clarification, direct effects are directly attributable from variable to another, while indirect effects refer to the effect that is indirectly made from one variable to another through a mediating variable. The total effect of a variable is the sum of these two effects.

5.1.1. Indices of Fit

In SEM, a hypothesis cannot be accepted as fact, as it is theoretical model proposed by the researcher. Consequently, it is necessary for the researcher to evaluate how well their model fits the data after estimating parameters. Several indices of fit have been developed to serve this purpose. In this study, structural models will be verified with several indices of fit identified in Table 5-1. Many of these indices are susceptible to some aspect of the model. For example, the chi-squared index is sensitive to sample size. This may cause the researcher to fail to reject an inappropriate model in small sample sizes and reject an appropriate model in large sample sizes [6]. Accordingly, several indices should be referenced when evaluating the fit of each respective SEM model.

Table 5-1. Indices of fit.

Index of Fit	Description
χ^2 (Chi-Square)	The chi-square index tests the statistical significance of a model. This tests the null hypothesis that the predicted model and observed data are equal. $\chi^2 = (N-1)f_{ML}$ $\quad$ $df = \frac{1}{2}n(n+1) - p$ *Where:* *N: number of observations, n: number of observed variables* *p: number of estimated parameters, f_{ML}: fitness of maximum likelihood.* χ^2 is determined as followed: $\chi^2 \geq \chi^2(df, a) \Rightarrow$ Model is rejected $\chi^2 \leq \chi^2\,(df, a) \Rightarrow$ Model is not rejected
GFI (Goodness of Fit)	GFI is a measure of fit between the hypothesised model and the observed covariance matrix. GFI produces a value between 0-1. Values over 0.90 indicate good model fit. $\mathrm{GFI} = 1 - \frac{\mathrm{tr}((\Sigma(\hat{\theta})^{-1}(S - \Sigma(\hat{\theta}))))^2)}{\mathrm{tr}(\Sigma(\hat{\theta})^{-1}S\,)^2))}$ $\quad$ $\mathrm{tr}((A)^2) = tr(AA')$
AGFI (Adjusted Goodness of Fit)	AGFI is a modified version of GFI that is less susceptible to the number of indicators of each latent variable or degrees of freedom in the model. AFGI produces a value between 0-1. Values over 0.90 indicate good model fit. $\mathrm{AFGI} = 1 - \frac{n(n+1)}{2df}(1 - \mathrm{GFI})$
RMSEA (Root Mean Square Error of Approximation)	RMSEA shows the gap between the real distribution and the model distribution per one degree of freedom. Values below 0.10 indicate good model fit. $\mathrm{RMSEA} = \sqrt{\max\left(\frac{f_{ML}}{df} - \frac{1}{N-1}, 0\right)}$

5.1.2. Measured and Latent Variables

Structural models consist of five types of components – observed variables, latent variables, exogenous variables, endogenous variables, and error or disturbance terms. Observed variables are those that are directly observed or measured in the model and related to latent variables. Latent variables are indirectly measured as they are not directly observed or measured. Exogenous variables are variables that have an impact on other variables. Endogenous variables are variables that are influenced by other variables. Finally, error terms contain the measurement and structure error in the model.

Another key characteristic of SEM is that it allows apriori control, as the researcher conducts the analyses after a theoretical model has been proposed. This involves determining which latent constructs are determined by observed factors, and how all components in the model interact or are causally related. Consequently, the first step in SEM is to establish the theoretical model and determine the hypothetical relationships between model components. Naturally, several factors in this study exhibit some collinearity, as they evaluate similar characteristics that influence pedestrian activity. For example, path characteristics, such as the level of obstructions and modal conflict have a natural relationship, considering some obstructions may be parked vehicles on a path, or may cause pedestrians to enter the roadway bringing them into conflict with vehicular traffic. This connection makes these two factors suitable for feeding into a latent construct addressing either path quality or comfort. These kinds of relationships are what must be considered when developing a general hypothesis explaining segment-level pedestrian density in target cities.

Table 5-2. Latent and measured variables used in structural equation models.

Latent Variable	Measured Variables
Path Quality	Path Width, Path Exclusivity, Modal Conflict, Path Obstructions
Accessibility	Retail (proportion), Residential (proportion), Bus Proximity, Metro Proximity
Absence of Latent Construct	Betweenness, Straightness

Measured variables and latent constructs are shown in Table 5-2. Factors influencing segment-level pedestrian density are grouped into two latent variables – Path Quality and Accessibility. Path Quality is composed of the path width, path exclusivity, modal conflict, and path obstruction observed variables. This construct measures the quality of the pedestrian environment in terms of safety, comfort, and ease of movement. Accessibility is composed of the proportion of ground floor retail and residential land uses per segment, bus proximity, and metro proximity observed variables. Thus, the accessibility latent construct evaluates accessibility to land use and transport opportunities. Finally, due to the unreliable performance of individual centrality metrics across study sites noted in Chapter 4, betweenness and straightness centrality will participant in structural models as directly observed variables, as these variables appear to have the strongest relationship with pedestrian activity. It had been hoped that that these variables could form a centrality latent construct. However, validity and reliability analyses reported issues with convergent and discriminant validity, affecting the ability of the AMOS software to find a solution within a suitable number of iterations.

5.1.3. Hypothesis Relating Factors to Segment-Level Pedestrian Density

The theoretical model and hypothesised causal relationships are shown in Figure 5-1. In this theoretical model, it is hypothesised that accessibility has a direct positive effect on pedestrian density, and a positive indirect effect on pedestrian density mediated via path quality. Path quality has a positive direct effect on pedestrian density only, which is anticipated to be weaker than that of accessibility. In addition to these latent constructs, both betweenness and straightness centrality that are directly observed, are hypothesised to have a positive direct effect on pedestrian density and an indirect effect mediated via the accessibility and path quality latent constructs. In other words, it is theorised that network links that are more likely to be chosen and are visually connected, are likely to have an impact on path quality and accessibility.

These hypothetical relationships to pedestrian density can be expressed by the following equations:

*Std. Total Effect (Accessibility) = Std. Direct Effect (a) + Std. Indirect Effect (b*c)*
Std. Total Effect (Path Quality) = Std. Direct Effect (c)
*Std. Total Effect (Betweenness) = Std. Direct Effect (d) + Std. Indirect Effect (c*e+a*f+b*c*f)*
*Std. Total Effect (Straightness) = Std. Direct Effect (g) + Std. Indirect Effect (c*h+a*i+b*c*i)*

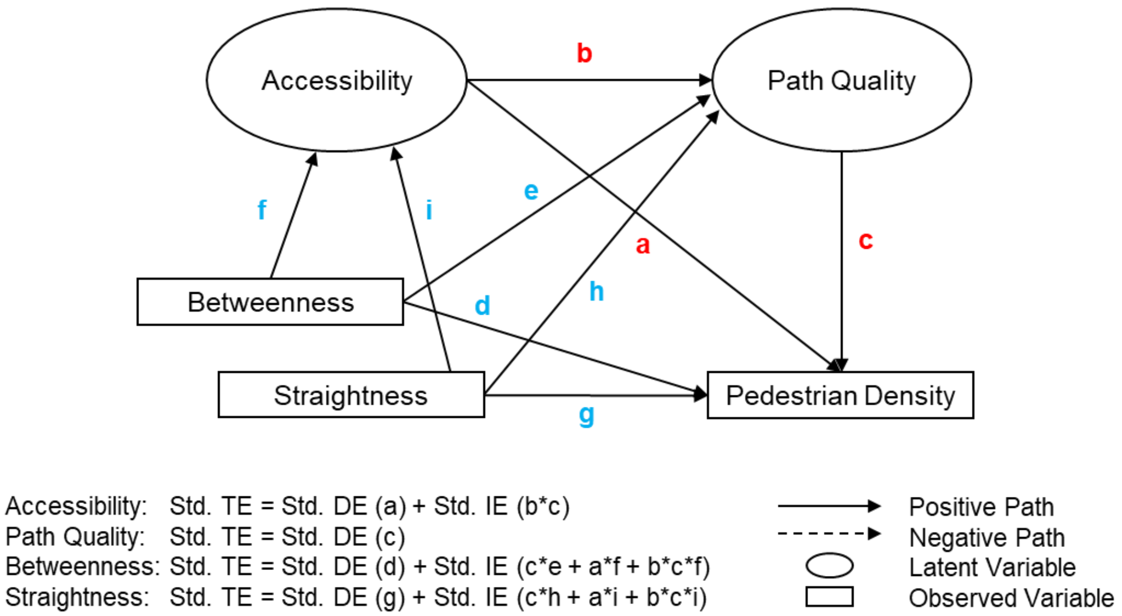


Figure 5-1. Theoretical model relating latent constructs and observed variables to pedestrian density.

5.2. Structural Equation Models

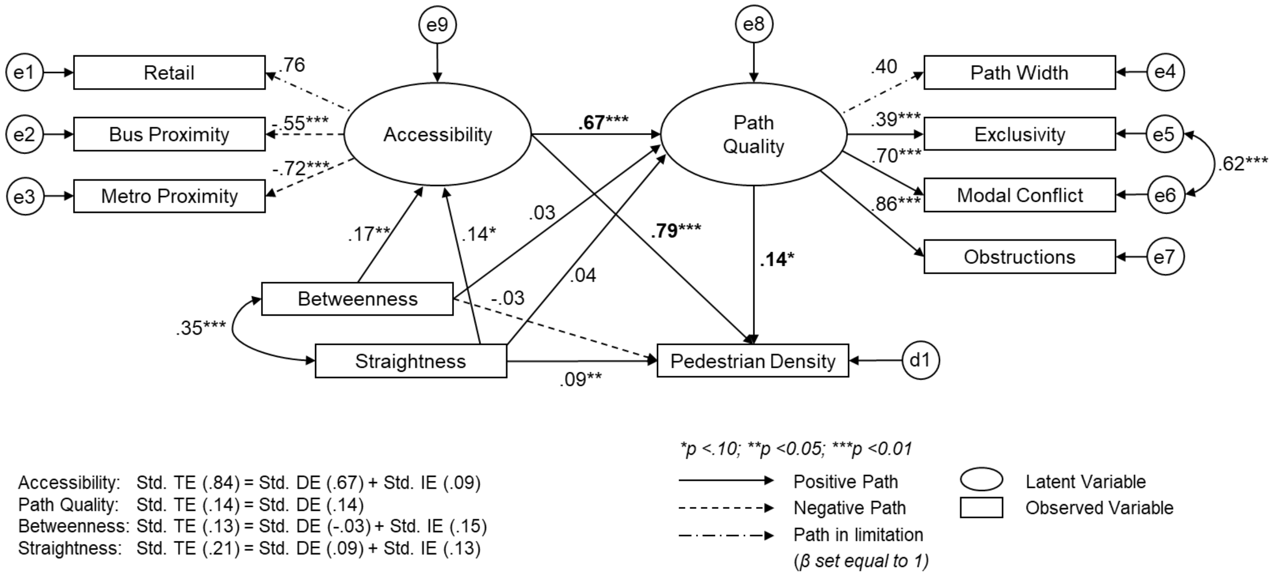
In this analysis, study sites are consolidated by their respective target city. This is necessary, as SEM generally requires a high number of observations per parameter to produce valid and reliable estimates [7]-[9] and to ensure that research hypotheses are correctly evaluated [6]. All SEM models consist of the above latent constructs, and both betweenness and straightness centralities. However, latent constructs may have a different number of factors in each model, as low loading factors (<0.30) are omitted to improve model fit statistics.

5.2.1. Bangkok

Figure 5-2 shows Bangkok's structural model and reports associated model fit statistics and standardised parameter estimates. Model fit indices are: χ^2=110.761 *(df=29),* GFI=.915, AGFI=0.827, RMSEA=0.117. The GFI is solid. However, the AFGI and RMSEA indices are below their acceptable thresholds indicating poor model fit. Thus, some parameter estimates should be accepted with caution.

Focusing on latent constructs first, the direct causal path between accessibility and pedestrian density is strong with a coefficient of 0.79 *($p < 0.01$)*. Factor loadings on accessibility are strong and are all highly significant *($p < 0.01$).* The causal path from accessibility to path quality is also strong with a coefficient 0.67 *($p < 0.01$).* Conversely, the causal path from path quality to pedestrian density is weak reporting a coefficient of 0.14 *($p < 0.10$).* Factor loadings on path quality are strong and significant with the exception of path width and path exclusivity. Concerning the directly observed variables of betweenness and straightness centrality, weak direct relationships are revealed between each variable and pedestrian density. While it is hypothesised that both centrality variables have a positive impact on path quality, no relationship is reported in the model results. On the other hand, centrality variables have a positive, albeit weak impact on accessibility. The causal paths from betweenness and straightness on accessibility are 0.17 *($p < 0.05$)* and 0.14 *($p < 0.10$)*, respectively.

The standardised total effect of accessibility on pedestrian density is 0.84 *($p<0.01$)*, with direct and indirect effects of 0.67 and 0.09, respectively. The standardised total effect of path quality on pedestrian density is 0.14 *($p<0.10$).* The total effect of betweenness on pedestrian density is 0.13 *($p<0.10$)*, with of direct and indirect effects of -0.03 and 0.15. Finally, the total effect of straightness on pedestrian density is 0.21 *($p<0.05$)* with direct and indirect effects of 0.09 and 0.13, respectively.



χ^2		GFI	AFGI	RMSEA
110.761	*df = 29*	.915	.827	.117

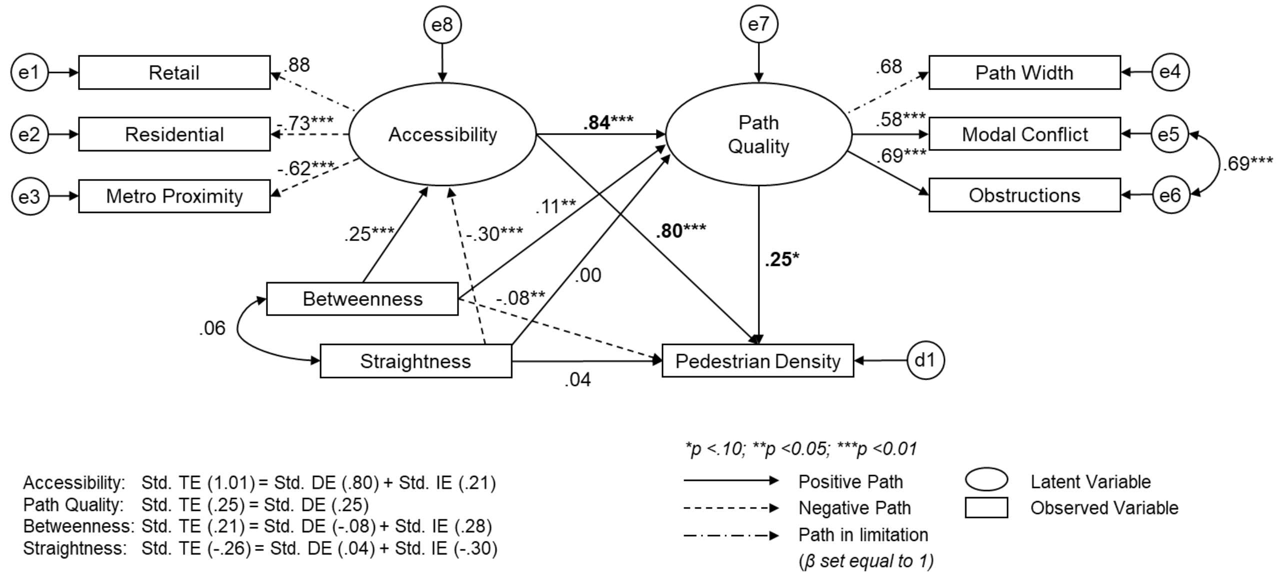
Figure 5-2. Bangkok: structural equation model.

5.2.2. Manila

Manila's structural model, associated model fit statistics, and standardised parameter estimates are shown in Figure 5-3. Model fit indices are: χ^2=49.494 *(df=19),* GFI=.956, AGFI=0.896, RMSEA=0.084. All model fit indices are strong indicating good model fit. This model is modified by removing bus proximity and path exclusivity due to low loadings on their respective latent construct. Residential land use is incorporated into the accessibility latent construct due to the high number of residential streets surveyed in Manila. Additionally, this model differs from other cities by covarying modal conflict and path obstructions. These variables are closely related due to the high number of obstructions that force pedestrians to walk in many streets. Therefore, setting a covariance between these variables is logical and does alter the underlying model structure.

The causal path between accessibility and pedestrian density is strong with a coefficient of 0.80 *($p < 0.01$)*. Similarly, the path from accessibility to path quality is also strong with a coefficient 0.84 *($p < 0.01$).* Conversely, the causal path from path quality to pedestrian density is weak with a coefficient of 0.25 *($p < 0.10$).* Weak negative and positive causal relationships with pedestrian density are also observed for betweenness and straightness, respectively. Betweenness is the only centrality variable that has a weak relationship with path quality with a coefficient of 0.11 *($p <0.05$).* Centrality variables have stronger relationships with accessibility reporting coefficients of 0.25 *($p < 0.01$)* and -0.30 *($p < 0.01$)* for betweenness and straightness, respectively.

The standardised total effect of accessibility on pedestrian density is 1.01 *($p<0.01$)*, with direct and indirect effects of 0.80 and 0.21, respectively. The standardised total effect of path quality on pedestrian density is 0.25 *($p<0.10$).* The total effect of betweenness on pedestrian density is 0.21 *($p<0.01$)* with direct and indirect effects of -0.08 and 0.28. Finally, the total effect of straightness on pedestrian density is -0.26 *($p<0.01$)* with direct and indirect effects of 0.04 and -0.30, respectively.



χ^2		GFI	AFGI	RMSEA
49.494	*df = 19*	.956	.896	.084

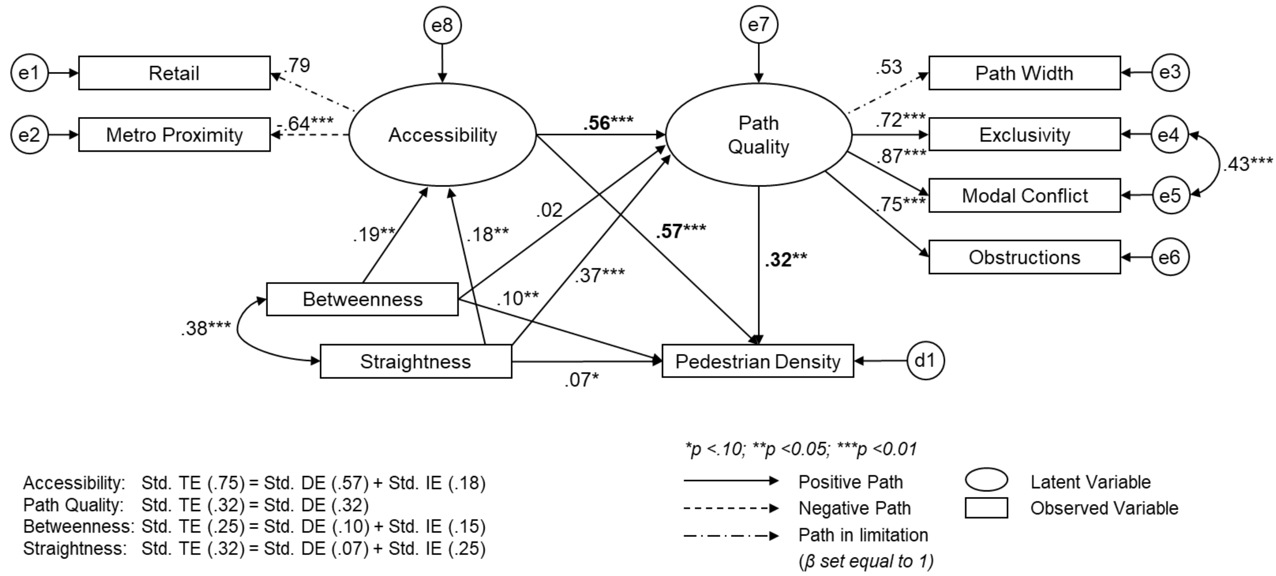
Figure 5-3. Manila: structural equation model.

5.2.3. Osaka

Figure 5-4 shows Osaka's structural model and reports associated model fit statistics and standardised parameter estimates. Model fit indices are: χ^2=58.691 *(df=19),* GFI=.956, AGFI=0.895, RMSEA=0.089. All model fit indices are strong indicating good model fit. This model is modified by removing bus proximity and residential land uses due to low factor loadings on the accessibility latent construct.

All paths between latent constructs and pedestrian density are positive. The causal path between accessibility and pedestrian density is strong with a coefficient of 0.57 *($p < 0.01$)*. The mediating path from accessibility to path quality is also strong with a coefficient 0.56 *($p < 0.01$).* Interestingly, the causal path from path quality to pedestrian density is far higher than the previous cities with a coefficient of 0.32 *($p < 0.05$).* Results indicate that there is no relationship between betweenness and path quality. However, a moderate relationship is revealed for straightness reporting a coefficient of 0.37 *($p < 0.01$).* This is likely explained by how visually connected paths, such as those in public spaces, pedestrian zones and arcades are often wider, exclusive paths, free from obstructions and interactions with other transport modes. Both centrality variables have weak causal relationships with accessibility reporting coefficients of 0.19 *($p < 0.01$)* and 0.18 *($p < 0.01$)* for betweenness and straightness, respectively.

The standardised total effect of accessibility on pedestrian density is 0.75 *($p<0.01$)*, with direct and indirect effects of 0.57 and 0.18, respectively. The standardised total effect of path quality on pedestrian density is 0.32 *($p<0.05$).* The total effect of betweenness on pedestrian density is 0.25 *($p<0.01$)* with direct and indirect effects of 0.10 and 0.15. Finally, the total effect of straightness on pedestrian density is 0.32 *($p<0.01$)* with direct and indirect effects of 0.07 and 0.25, respectively. These standardised total effects for both path quality and centrality variables are higher than in Bangkok and Manila.



χ^2		GFI	AFGI	RMSEA
58.691	*df = 19*	.956	.895	.089

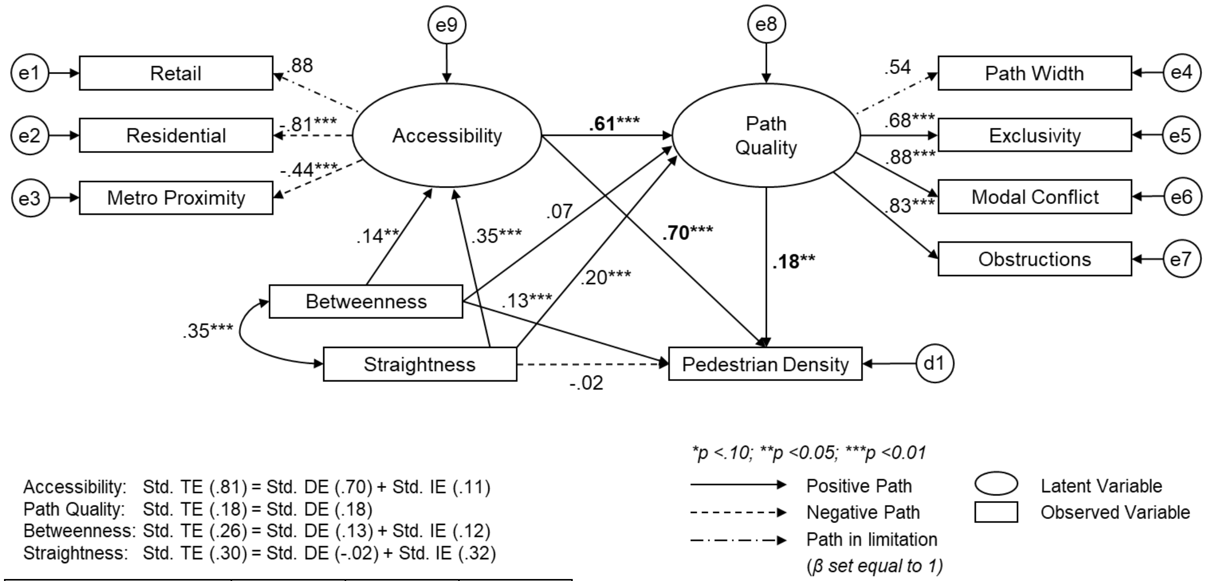
Figure 5-4. Osaka: structural equation model.

5.2.4. Taipei

Taipei's structural model, associated model fit statistics, and standardised parameter estimates are shown in Figure 5-5. Model fit indices are: χ^2=60.083 *(df=29),* GFI=.955, AGFI=0.911, RMSEA=0.064. These indices are excellent and are the best in this study. This model is modified by removing bus proximity due to low factor loadings on accessibility. Additionally, unlike Bangkok and Osaka, there is no covariance between path exclusivity and modal conflict. This is attributable to the frequent occurrence of scooters driving and parking on sidewalks.

All paths between latent constructs and pedestrian density are positive. The causal path between accessibility and pedestrian density is strong with a coefficient of 0.70 *($p < 0.01$)*. As with all models, the path from accessibility to path quality is also strong with a coefficient 0.61 *($p < 0.01$).* The causal path from path quality to pedestrian density is relatively weak with a coefficient of 0.18 *($p < 0.05$).* Results indicate that there is no relationship between betweenness and path quality. However, a weak relationship is revealed for straightness with a coefficient of 0.20 *($p < 0.01$).* Betweenness has a weak relationship with accessibility with a coefficient of 0.14 *($p < 0.05$).* However, straightness has the strongest relationship with accessibility among all study sites with a coefficient of 0.35 *($p < 0.01$).* The stronger performance of straightness is likely identical to that given for Osaka. However, a key factor in its performance is due to how Taipei study sites are characterised by straight long sidewalks fronting main streets. These sidewalks are typically very wide and retail heavy in nature.

The standardised total effect of accessibility on pedestrian density is 0.81 *($p<0.01$)*, with direct and indirect effects of 0.70 and 0.11, respectively. The standardised total effect of path quality on pedestrian density is 0.18 *($p<0.05$).* The total effect of betweenness on pedestrian density is 0.26 *($p<0.01$)* with direct and indirect effects of 0.13 and 0.12. Finally, the total effect of straightness on pedestrian density is 0.30 *($p<0.01$)* with direct and indirect effects of -0.02 and 0.32, respectively.



χ^2		GFI	AFGI	RMSEA
60.083	*df = 29*	.955	.911	.064

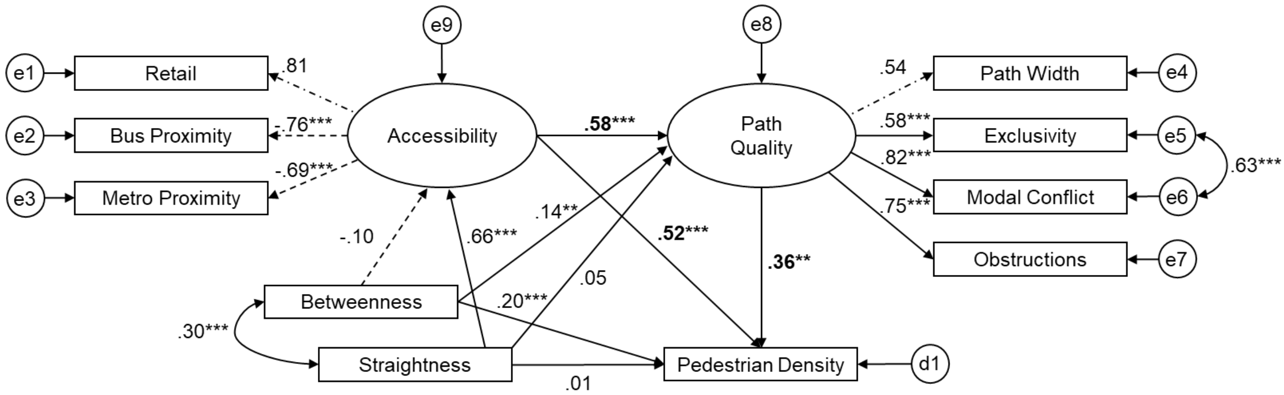
Figure 5-5. Taipei: structural equation model.

5.2.5. Tokyo

Figure 5-6 shows Tokyo's structural model and reports associated model fit statistics and standardised parameter estimates. Model fit indices are: χ^2=80.640 *(df=27),* GFI=.937, AGFI=0.872, RMSEA=0.090. All model fit indices are strong indicating good model fit. This model is modified by removing residential land uses due to low factor loadings on the accessibility latent construct.

All paths between latent constructs and pedestrian density are positive. The causal path between accessibility and pedestrian density is strong with a coefficient of 0.52 *($p < 0.01$)*. The mediating path from accessibility to path quality is also strong with a coefficient 0.58 *($p < 0.01$)*. Notably, the causal path from path quality to pedestrian density is the highest among all cities with a coefficient of 0.36 *($p < 0.05$)*. Results indicate that there is no relationship between straightness and pedestrian density. However, a weak relationship is revealed for betweenness reporting a coefficient of 0.20 *($p < 0.01$)*. Additionally, betweenness is the only centrality variable that has a weak relationship with path quality with a coefficient of 0.14 *($p <0.05$)*. Concerning the relationship between centrality and accessibility, it is only straightness that has a significant strong causal relationship reporting a path coefficient of 0.66 *($p < 0.01$)*.

The standardised total effect of accessibility on pedestrian density is 0.73 *($p<0.01$)*, with direct and indirect effects of 0.52 and 0.21, respectively. The standardised total effect of path quality on pedestrian density is 0.36 *($p<0.01$)*. The total effect of betweenness on pedestrian density is 0.17 *($p<0.01$)* with direct and indirect effects of 0.20 and -0.02. Finally, the total effect of straightness on pedestrian density is 0.51 *($p<0.01$)* with direct and indirect effects of 0.01 and 0.50, respectively. These standardised total effects for both path quality and centrality variables are the best encountered in this study.



*p <.10; **p <0.05; ***p <0.01

Accessibility: Std. TE (.73) = Std. DE (.52) + Std. IE (.21)
Path Quality: Std. TE (.36) = Std. DE (.36)
Betweenness: Std. TE (.17) = Std. DE (.20) + Std. IE (-.02)
Straightness: Std. TE (.51) = Std. DE (.01) + Std. IE (.50)

Positive Path
Negative Path
Path in limitation
(β set equal to 1)
Latent Variable
Observed Variable

χ^2		GFI	AFGI	RMSEA
80.640	*df* = 27	.937	.872	.090

Figure 5-6. Tokyo: structural equation model.

Table 5-3. Total effects on hypothesised relationships in target cities.

City	Path*	Direct Effect**	Indirect Effect	Total Effect	Significance ($p < 0.05$)
Bangkok	AC → PD	0.67	0.09	0.84	Accept
	PQ → PD	0.14	-	0.14	Reject
	BC → PD	-0.03	0.15	0.13	Accept
	SC → PD	0.09	0.13	0.21	Accept
Manila	AC → PD	0.80	0.21	1.01	Accept
	PQ → PD	0.25	-	0.25	Reject
	BC → PD	-0.08	0.28	0.21	Accept
	SC → PD	0.04	-0.30	-0.26	Accept
Osaka	AC → PD	0.57	0.18	0.75	Accept
	PQ → PD	0.32	-	0.32	Accept
	BC → PD	0.10	0.15	0.25	Accept
	SC → PD	0.07	0.25	0.32	Accept
Taipei	AC → PD	0.70	0.11	0.81	Accept
	PQ → PD	0.18	-	0.18	Accept
	BC → PD	0.13	0.12	0.26	Accept
	SC → PD	-0.02	0.32	0.30	Accept
Tokyo	AC → PD	0.52	0.21	0.73	Accept
	PQ → PD	0.36	-	0.36	Accept
	BC → PD	0.20	-0.02	0.17	Accept
	SC → PD	0.01	0.50	0.51	Accept

* AC: Accessibility, PD: Pedestrian Density, PQ: Path Quality, BC: Betweenness, SC: Straightness

** Effects are calculated with the standardised coefficient of each path.

5.2.6. Hypothesis Testing

Table 5-3 assesses the feasibility of each hypothetical relationship between observed and latent constructs and their relationship with segment-level pedestrian density in each city. This is done by reviewing each variable's associated effects and level of statistical significance.

With the exception of Bangkok and Manila, hypothesised relationships are proven in almost all situations and there are commonalities across all city models. Firstly, paths between latent constructs (accessibility and path quality) and pedestrian density, are positive and significant proving their hypothesised relationships. Reviewing the standardised total effects of each latent construct, it its revealed that accessibility has a far higher impact on pedestrian density than path quality. This is expected based on the performance of accessibility variables in earlier multivariate regression analyses and confirms that pedestrians first orient themselves in terms of land use and transportation opportunities, rather than the environmental qualities of pedestrian paths [10]. Regarding the poor performance of path quality on pedestrian density in Bangkok and Manila, this was anticipated, as it was theorised that in more developing environments pedestrians are less influenced by the quality of the walking environment or the condition of walking paths. This may point to a cultural attitude, but may be reflective of the fact that less is invested in pedestrian facilities in such environments. Excluding Manila, betweenness and straightness have a positive and significant total effect on pedestrian density ranging from 0.13 to 0.51. And, in all target cities, it is straightness that has a far higher standardised total impact on pedestrian density than betweenness.

These results are encouraging and prove a notable influence of centrality variables and path characteristics on segment-level pedestrian density in Asian city environments when utilising SEM. Model results also confirm that centrality and path quality have a higher total impact on pedestrian density in the denser and more developed environments, such as of Osaka, Taipei, and Tokyo as anticipated. Importantly, the negative relationship between straightness and pedestrian density needs to be taken with a pinch of salt. As discussed earlier in previous chapters, the Roosevelt site in Manila is highly residential in nature with a curvilinear street pattern. Thus, it is somewhat of an outlier in this study. This highlights a potential failing in the station selection process where network form characteristics perhaps should have been considered. Removing this site from Manila's analysis would likely alter the relationship of straightness from a negative to a positive relationship.

5.3. Conclusion

In this chapter, structural models confirmed the existence of hypothesised relationships between latent constructs and observed variables on segment-level pedestrian density. Excluding Bangkok, model results are good in terms of indices of fit and levels of significance. Paths connecting each latent construct and pedestrian density are positive, and behave as expected. Furthermore, the standardised total impacts of centrality and path quality on pedestrian density are higher in the more developed environments of Osaka, Taipei, and Tokyo, that tend be denser with respect to their pedestrian networks.

SEM proved a suitable technique for uncovering structural relationships between variables of interest that are not revealed in other multivariate analyses, including multivariate regression conducted in Chapter 4. Importantly, structural models reveal that while centrality metrics may not have a strong statistically significant direct and positive impact on segment-level pedestrian density, they often have a considerable impact mediated via accessibility and path quality latent variables. This is best exemplified by the standardised total effects reported in Osaka, and to a lesser extent, Taipei. In these study sites, direct effects on pedestrian density are low while their mediated indirect effects are positive and much higher. This underlies the strength of this technique. The proceeding chapter will build on this analysis and investigate how these relationships vary based on each target city's level of development by conducing multigroup analysis.

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Chapter 6: Comparative Analysis Utilising Multigroup Analysis

In Chapter 5, structural models were developed for each target city. Results showed that when considering the total standardised effects of latent constructs (accessibility and path quality) and centrality variables on pedestrian density, that in most cases, standardised total effects are positive and significant. Notably, the impact of centrality and path quality is stronger and more significant in the denser and more developed environments of Osaka, Taipei, and Tokyo. A key hypothesis of this study is that in more highly developed pedestrian environments, path quality and centrality are more influential in explaining pedestrian activity. This may be due to pedestrians in lower developed environments being more accustomed to poorer walking conditions and how their pedestrian networks are not as developed. However, this must be statistically tested. The inclusion of cities in Southeast and East Asia, provide an opportunity to investigate how the hypothesised relationships introduced in Chapter 5, differ with respect to each city's level of development.

In this chapter, two groups are distinguished: lower developed pedestrian environments – consisting of Bangkok and Manila; and higher developed pedestrian environments – represented by Osaka and Tokyo. Structural equation modelling (SEM) is once again employed. However, the purpose of this chapter is not to fit the perfect model for each group. Rather, it is to test how hypothesised relationships vary by level of development, and establish if path quality and centrality are more influential in explaining pedestrian movement densities in higher developed pedestrian environments. To achieve this goal, multigroup analysis is conducted and results evaluated with a chi-squared difference test. This will confirm whether there is a statistical significance between groups in terms of the parameters being estimated in the theoretical model introduced in the previous chapter.

6.1. Multigroup Analysis by Level of Development

To conduct multigroup analyses, two groups are proposed: lower developed pedestrian environments consisting of Bangkok and Manila; and higher developed pedestrian environments – represented by Osaka and Tokyo. These designations were determined by the UN Human Development Index (HDI) that ranks countries based on per capita income, education, and life expectancy [1]. Bangkok and Manila are classified as lower developed pedestrian environments by virtue of their lower HDI scores of 0.755 and 0.699, while Osaka and Tokyo are selected owing to their HDI score of 0.909.

This chapter maintains the same theoretical model and hypothesised relationships introduced in Chapter 5. The theoretical model is shown for reference purposes in Figure 6-1. Unlike the previous analyses, the models analysed for both groups are identical in terms of paths and covariances. In addition, latent constructs consist of identical factors. This was done by only including factors that had acceptable loadings of greater than 0.30 for both development groups.

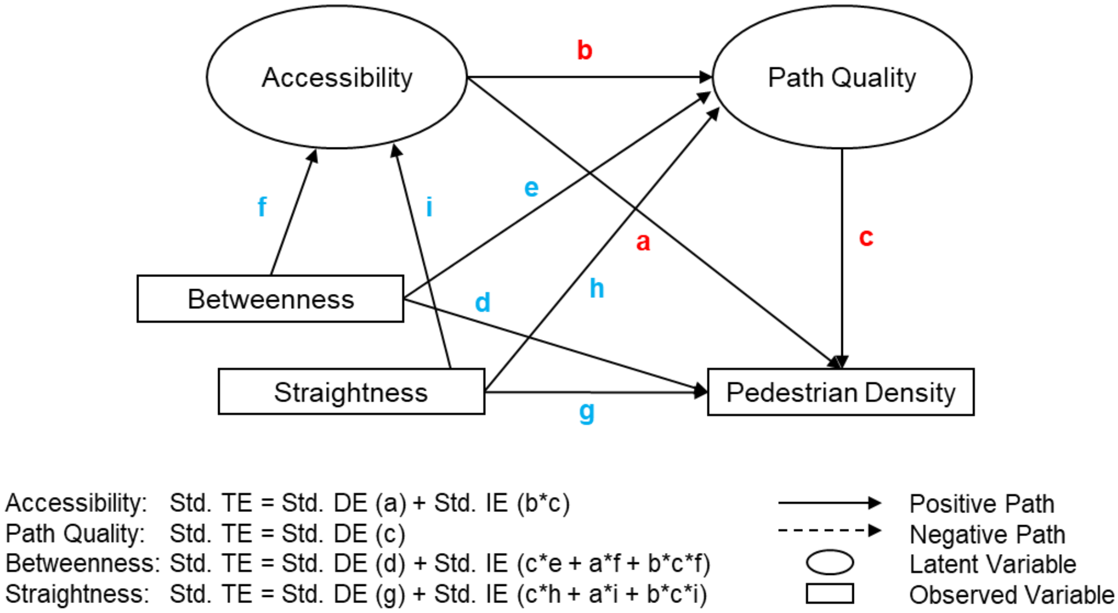


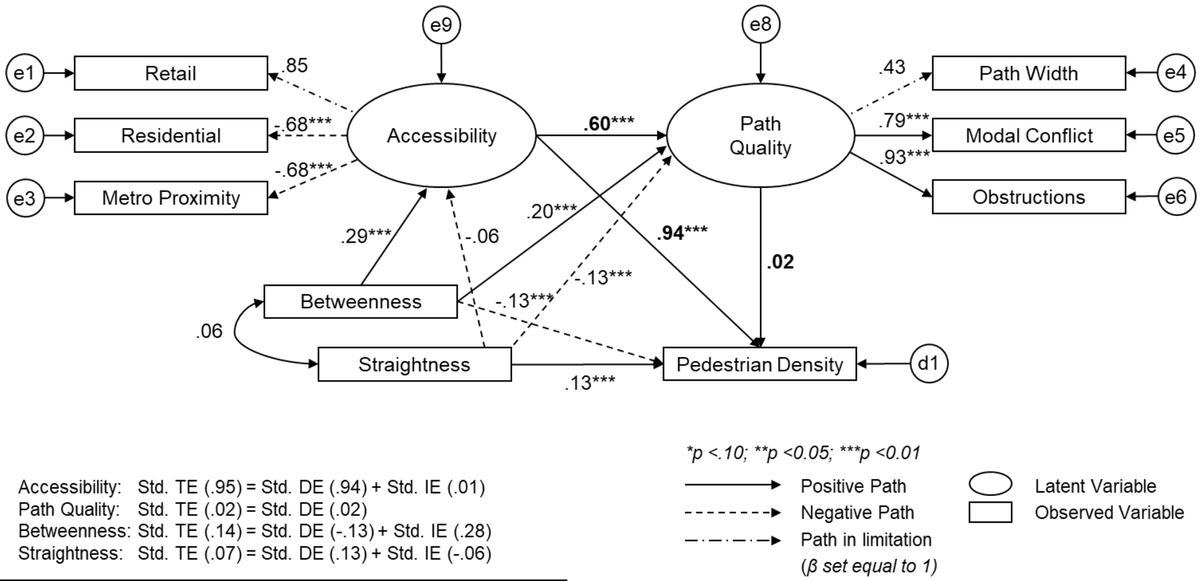
Figure 6-1. Theoretical model relating latent constructs and observed variables to pedestrian density.

6.1.1. Lower Developed Pedestrian Environments

Figure 6-2 shows the structural model for lower developed pedestrian environments and reports associated model fit statistics and standardised parameter estimates. Model fit indices are: χ^2= 132.585 *(df=20),* GFI=.942, AGFI=0.870, RMSEA=0.111. Model fit indices are fairly solid with the exception of AFGI and RMSEA that are just below their acceptable thresholds.

Focusing on latent constructs first, the direct causal path between accessibility and pedestrian density is strong with a coefficient of 0.94 *(p < 0.01)*. Factor loadings on accessibility are strong and are all highly significant *(p < 0.01).* The causal path from accessibility to path quality is also strong with a coefficient 0.60 *(p < 0.01).* Conversely, the causal path from path quality to pedestrian density is weak reporting a coefficient of 0.02 that is not statistically significant. Factor loadings on path quality are robust and highly significant *(p < 0.01)*. Concerning the directly observed variables of betweenness and straightness centrality, weak direct relationships are revealed between each variable and pedestrian density. Results reveal that betweenness has a negative direct impact on pedestrian density, while straightness has a weak positive impact with absolute coefficients of 0.13 *(p < 0.01).* The impact of centrality on path quality is mixed. Betweenness has a weak positive relationship while straightness has a weak negative relationship with coefficients 0.20 *(p < 0.01)* and *-0.13*, respectively. The impact of centrality on accessibility is also mixed. Only betweenness has a relationship of note with a positive coefficient of 0.29 *(p < 0.01).*

The standardised total effect of accessibility on pedestrian density is 0.95 *(p<0.01)*, with direct and indirect effects of 0.94 and 0.01, respectively. The standardised total effect of path quality on pedestrian density is 0.02 *(non-significant).* The total effect of betweenness on pedestrian density is 0.14 *(p<0.01)* with direct and indirect effects of -0.13 and 0.28. Finally, the total effect of straightness on pedestrian density is 0.07 *(non-significant)* with direct and indirect effects of 0.13 and -.06, respectively.



χ^2		GFI	AFGI	RMSEA
132.585	*df = 20*	.942	.870	.111

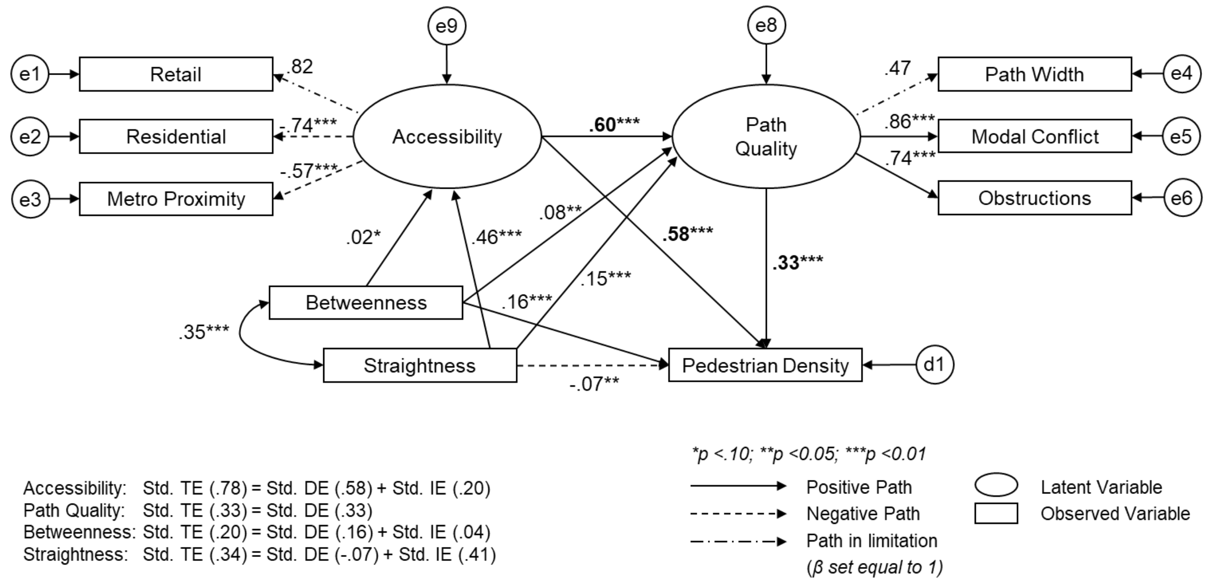
Figure 6-2. Lower Developed Pedestrian Environments: structural equation model.

6.1.2. Higher Developed Pedestrian Environments

Figure 6-3 shows the structural model for higher developed pedestrian environments and reports associated model fit statistics and standardised parameter estimates. Model fit indices are: χ^2=56.011 *(df=20),* GFI=.976, AGFI=0.946, RMSEA=0.60. These indices are excellent and far stronger than the lower developed group.

All paths between latent constructs and pedestrian density are positive. The causal path between accessibility and pedestrian density is strong with a coefficient of 0.60 *(p < 0.01)*. The mediating path from accessibility to path quality is also strong with a coefficient 0.58 *(p < 0.01).* Compared to the lower developed group, the causal path between path quality and pedestrian density is larger and more robust with a coefficient of 0.33 *(p < 0.01)*. The higher developed group also differs in the relationship between centrality and path quality. Here, in contrast to the lower developed group, betweenness has a weaker relationship with path quality with a coefficient of 0.08 *(p < 0.01)*, while straightness has a positive relationship with a coefficient of 0.15 *(p < 0.01)*. Furthermore, in contrast to the lower developed group, betweenness has no causal relationship with accessibility, while straightness has a much stronger causal relationship with a coefficient of 0.46 *(p < 0.01)*.

The standardised total effect of accessibility on pedestrian density is 0.78 *(p<0.01)*, with direct and indirect effects of 0.58 and 0.20, respectively. The standardised total effect of path quality on pedestrian density is 0.33 *(p<0.01).* The total effect of betweenness on pedestrian density is 0.20 *(p<0.01)* with direct and indirect effects of 0.16 and 0.04. Finally, the total effect of straightness on pedestrian density is 0.34 *(p<0.01)* with direct and indirect effects of -0.07 and 0.41, respectively. These standardised total effects for both path quality and centrality variables are far better than those reported for the lower developed group.



χ^2		GFI	AFGI	RMSEA
56.011	20	.976	.946	0.60

Figure 6-3. Higher Developed Pedestrian Environments: structural equation model.

Table 6-1. Total effects on hypothesised relationships by level of development.

Level of Development	Path*	Direct Effect**	Indirect Effect	Total Effect	Significance *($p < 0.05$)*
Lower	AC → PD	0.94	0.01	0.95	Accept
	PQ → PD	0.02	-	0.02	Reject
	BC → PD	-0.13	0.28	0.14	Accept
	SC → PD	0.13	-0.06	0.07	Reject
Higher	AC → PD	0.58	0.20	0.78	Accept
	PQ → PD	0.33	-	0.33	Accept
	BC → PD	0.16	0.04	0.20	Accept
	SC → PD	-0.07	0.41	0.34	Accept

* AC: Accessibility, PD: Pedestrian Density, PQ: Path Quality, BC: Betweenness, SC: Straightness

** Effects are calculated with the standardised coefficient of each path.

6.1.2. Hypothesis Testing

Table 6-1 assesses the feasibility of each hypothetical relationship between observed and latent constructs and their relationship with segment-level pedestrian density for each development group. As with Chapter 5, this is done by reviewing each variable's associated effects and level of statistical significance.

Consistent with Chapter 5, accessibility dominates and has the largest standardised total impact on pedestrian density *(Lower: 0.95, $p < 0.01$; Higher: 0.78, $p < 0.01$)*. Focusing on the lower developed group, the hypothesised relationships between accessibility and betweenness on pedestrian density are accepted. On the other hand, the total standardised effects of path quality and straightness on pedestrian density are low and fail to reach the minimum level of statistical significance. Consequently, their hypothetical relationships with pedestrian density are rejected. In contrast, all hypothesised relationships are accepted and the standardised total effects of variables other than accessibility are more notable for the higher developed group. Regarding the rejection of path quality and straightness for the lower developed group, this is actually a positive result. A key premise of this study is that path quality and centrality variables are not as important in influencing segment-level pedestrian density in lower developed pedestrian environments.

These results are encouraging and provide further evidence for the hypotheses suggested. In general, structural results are far better for the higher developed group as anticipated. All hypothetical relationships of interest are proven. Importantly, these results suggest that that path quality and centrality have a higher total positive impact on pedestrian density in more developed pedestrian environments.

6.2. Multigroup Analysis by Level of Development

The above structural models reveal far stronger relationships between path quality and centrality variables with segment-level pedestrian density in the higher developed pedestrian environment group. Before accepting these results, multigroup analysis must be performed in order to test whether the differences between development groups are statistically significant.

Multigroup analysis establishes statistical significance through the comparison of a fully constrained model to a model in which all structural parameters are freely estimated [2]. A fully constrained model is when structural parameters for the lower and higher developed groups are set equal. The final proof of statistical significance is confirmed by performing a chi-squared difference test in AMOS 28.

Table 6-2. Chi-squared difference test (model-level).

Model	Degrees of Freedom	χ^2	p-value	Result
Freely Estimated	13	312.385	0.000	Accept

Table 6-2 reports the chi-squared difference test for the freely estimated model compared to the fully constrained model. Model fit indices are: χ^2=312.385 *(df=13)* and p-value=0.000. These results indicate that the two models are statistically non-invariant. In other words, model results are different for the lower developed and higher developed groups and these results are statistically significant. Thus, at a high level, the relationships between latent constructs and observed variables differ for lower and higher developed pedestrian environments. To establish which paths are significantly different, parameters of interest need to be individually constrained and chi-squared tests performed at the path-level.

Table 6-3. Chi-squared difference (path-level).

Model	Total Effect *	Degrees of Freedom	χ^2	p-value	Result
Freely Estimated	AC → PD	3	34.341	0.000	Accept
	PQ → PD	1	8.545	0.003	Accept
	BC → PD	6	97.961	0.000	Accept
	SC → PD	6	146.152	0.000	Accept

* AC: Accessibility, PD: Pedestrian Density, PQ: Path Quality, BC: Betweenness, SC: Straightness

Table 6-3 reports chi-squared difference tests performed where the model is freely estimated with the exception of constraining all paths of interest to be equal across both development groups. This analysis tests whether the overall total effects of each latent construct and observed variable with pedestrian density is statistically different across both groups. Model fit indices are as follows – accessibility: χ^2=34.341 *(df=3),* p-value=0.000; path quality: χ^2=8.545 *(df=1),* p-value=0.003; betweenness: χ^2=97.962 *(df=6),* p-value=0.000; and straightness: χ^2=146.152 *(df=6),* p-value=0.000.

Accordingly, these fit statistics indicate that the total effects of each variable on pedestrian density is statistically significant across both development groups. Differences occur due to sizeable differences between standardised regression paths between both models.

6.3. Conclusion

In this chapter, structural models were constructed and multigroup analyses conducted to test how hypothetical relationships vary by level of development in the pedestrian environment. It was hypothesised that path quality and centrality are more influential in explaining pedestrian movement densities in higher developed pedestrian environments. Structural results revealed that these hypotheses are indeed true. In particular, structural results reveal that the influence of the latent construct of path quality on pedestrian density is non-significant and extremely weak in lower developed environments, in contrast to higher developed environments where the relationship is stronger and highly significant. The same trend is observed for straightness centrality, where once again it has no relationship of significance with pedestrian density the in lower developed group, in contrast to the higher developed environment group. Chi-squared difference tests provided further support for these hypotheses, revealing that the relationships between all variables of interest and pedestrian density are statistically significant across both development groups.

Based on the results reported in this chapter, it can be confidently claimed that centrality and path conditions perform better in explaining pedestrian movement densities in higher developed pedestrian environments. The findings for centrality can be attributed to the density and complexity in the pedestrian environment. In the higher developed group, the pedestrian network is better connected and more accessible. Regarding path quality or walking path conditions, the better performance of these factors in the higher developed group is likely attributable to the higher quality in these environments. For example, in higher developed environments, path obstructions and modal conflict are far better than in lower developed environments. The cultural attitude toward walking in each environment should also be considered too, but is difficult to ascertain without further qualitative analyses.

References

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Chapter 7: Conclusion

Understanding the factors that influence pedestrian activity is crucial in arming urban planners and designers with the knowledge they need to design pedestrian-friendly environments that support transport investments, and promote sustainable and liveable communities. To achieve this, it is paramount that the actual networks that pedestrians utilise are placed at the centre of pedestrian analyses. In the following sections, the key findings and significance of this study are discussed in reference to the study objectives stated in Chapter 1. Finally, recommendations for further research are presented.

7.1. Key Findings

This project set out to fulfil a number of research objectives. The first of these objectives was to determine the proportion of pedestrian activity that can be attributed to centrality measures derived from DPNs, both alone, and when controlling for other built environment factors. Chapter 4 confirmed that centrality measures derived from DPNs are associated with increased pedestrian activity. Results indicated that centrality alone can explain between 12-34% of segment-level pedestrian density in individual station environments, and 7-31% when individual sites are consolidated by target city. The influence of centrality is diminished when controlling for the built environment. When this is done, the primary factors in explaining pedestrian densities are the proportion of retail land uses, proximity to transit, and path width. Notably, centrality was more strongly associated with pedestrian activity in denser more developed pedestrian environments. Moreover, the most consistent centrality measures were betweenness and straightness centrality that were frequently associated with pedestrian density.

In Chapter 5, structural models were developed to clarify the underlying relationships between centrality, walking path characteristics, built environment factors, and pedestrian density. A theoretical model was proposed consisting of two latent constructs – accessibility and path quality; and two directly observed variables – betweenness and straightness centrality. SEM results confirmed the existence of hypothesised relationships in almost all situations. Paths connecting each latent construct and pedestrian density were positive, while paths connecting centrality to both latent constructs and pedestrian density revealed mixed results. Importantly, results showed that while centrality metrics may not have a strong statistically significant direct and positive impact on pedestrian density, it often had a considerable impact mediated via latent constructs, highlighting the usefulness of this technique. Reviewing the standardised total effects of each variable, it was revealed that accessibility had the highest impact on pedestrian density. Furthermore, the standardised total impacts of centrality and path quality on pedestrian density were higher in the denser and more developed environments of Osaka, Taipei, and Tokyo. These results prove that pedestrians first orient themselves in terms of land use and transportation opportunities, rather than the environmental qualities and centrality of pedestrian paths, but centrality and path quality had a larger impact on pedestrian density in more developed environments as anticipated.

In Chapter 6, multigroup analyses were conducted to clarify how hypothesised relationships vary by the level of development in each target city's pedestrian environment. The express goal of this analysis, was to establish if path quality and centrality are more influential in explaining pedestrian density in higher developed environments. Using the same theoretical model, target cities were grouped into lower developed pedestrian environments – consisting of Bangkok and Manila; and higher developed pedestrian environments – represented by Osaka and Tokyo. First, standardised total effects were evaluated in the same manner as Chapter 5. Focusing on centrality and path quality, structural results revealed that their influence was far stronger in the higher developed group. In the higher group, betweenness and straightness reported total effects of 0.20 *($p < 0.01$)* and 0.34 *($p < 0.01$)*, respectively. While in the lower developed group, betweenness and straightness reported total effects of 0.14 *($p < 0.05$)* and 0.07 *(non-significant)*. A similar trend was observed for path quality, where the higher group reported a total effect of 0.33 *($p < 0.01$)* versus 0.02 *(non-significant)* for the lower developed group. The higher effects reported for the higher developed group and the non-significance of straightness and path quality in the lower developed group, provides credence to this study's hypothesis that centrality and path quality play a more significant role in influencing pedestrian density in higher developed environments. Chi-squared difference tests provided further support for this hypothesis, revealing that the relationships between all variables of interest and pedestrian density are statistically significant across both development groups.

7.2. Significance of this Study

This study builds on existing studies by applying centrality and walking path survey approaches to DPNs in Asian station environments. Centrality metrics are rarely applied to DPNs. As a result, their successful application in this study in conjunction with other variables, is a significant contribution to the existing literature and further advances pedestrian network research in Asia. Moreover, this research lays a solid foundation for further investigation in this area with methods that can be applied to other regions globally.

A key tenet of this research, is that pedestrian environments and walking cultures differ internationally with respect to their level of development and approach to urban planning. While urban planning approaches are shifting globally to prioritise pedestrians over vehicles, the existence of pedestrian bridges and walkways in place of at-grade crossings, encountered during field surveys, strengthens the argument that less developed regions prioritise traffic flow over pedestrian accessibility. Additionally, field surveys to each study site reveal that walking path conditions are worse in cities such as Manila where obstructions and modal conflict are rife, degrading the pedestrian environment and impacting pedestrian perceptions of safety and comfort. The opposite of this is true in more developed and wealthier cities such as Osaka, Taipei, and Tokyo. Based on this study's results, it can be confidently claimed that centrality and path conditions perform better in explaining pedestrian movement densities in higher developed pedestrian environments.

The findings presented in this research imply that pedestrians orient themselves more strongly to retail attractors, proximity to rail transit, and path width, rather than solely the spatial structure of the DPN. However, research findings also imply that betweenness and straightness centrality are capable of explaining a sizeable portion of pedestrian density when derived from DPNs with minimal data requirement. Ultimately, the role that centrality plays is secondary when other built environment factors are considered, but is more notable in denser and higher developed environments. Thus, practitioners pursuing pedestrian-friendly environments should focus on promoting retail and transit accessibility, and wider pedestrian exclusive paths. Dense, well-connected networks should also be pursued to encourage further accessibility and connectivity. On this point, pedestrian network centrality can contribute to planning more pedestrian-centric cities by further understanding how people move and interact with the pedestrian environment. This is important for greater understanding of how cities should be designed to better accommodate pedestrian movement patterns.

7.3. Recommendations for Future Work

The results of this study are encouraging when evaluating both the methodological and analytical approach to utilising DPNs in Asians station environments. Nevertheless, this study is not without its flaws that arise due to issues relating to resources and scope. Here I identify a number of recommendations in which improvements should be considered for future work in this area. Adopting these recommendations would allow more concrete conclusions to be drawn, but should be weighed against future research objectives.

Recommendation 1: Extend Analytical Boundary

While OpenStreetMap (OSM) network data is helpful in creating DPNs, constructing networks is still a time-consuming process. As a result, the analytical focus of this study was limited to 400m. Centrality metrics are typically applied to larger networks. Thus, the findings of this research may be limited by the extent of the networks. Larger DPNs should be considered in future studies in different urban environments to help provide clarity to the effectiveness of centrality metrics derived from DPNs.

Recommendation 2: Revise Pedestrian Observation Approach

This research employed the 'snap-shot' method of recording pedestrians [1], [2]. This method was employed due to its simplicity and speed. This was crucial due to the high number of study sites surveyed solely by the author. While this method of recording pedestrians served its purpose, it often resulted in zero counts on some surveyed segments. Collecting pedestrian data over longer time periods at different times of the day would likely provide more robust results. Ultimately, surveying more segments per study site is highly desirable.

Recommendation 3: Broaden Geographic Scope

The present study was initially designed to analyse pedestrian environments outside of Asia by including study sites in Europe and North America. Unfortunately, due to Covid-19 this project was reduced significantly in size and its framing revised accordingly. However, there is a lot of merit in including study sites that represent different pedestrian environments globally when analysing the structural relationships in this study to provide further insight.

Recommendation 4: Broaden Study Variables

As with any study, data availability is often a concern and tradeoffs with research scope are a necessity. Data availability is particularly limited in Southeast Asian cities. As a result, key variables known to influence pedestrian activity, including job and population density were omitted. An interesting direction for this research to proceed in, is in reformulating structural models to understand the effect of variables in this study on the ridership of each station. Finally, including additional walking path characteristics variables that address the levelness and surface quality of paths is highly desirable as these factors varied widely among study sites.

References

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APPENDICES

Appendix A: List of Candidate Cities

City	HDI	GDP	Rapid Transport System(s)				Population		
			Name	Length (km)	Lines	Stations	City	Year	Source
Bangalore	0.640	45.1	Namma Metro	42.3	2	41	8,443,675	2011	Indian Census
Bangkok	0.755	306.8	BTS Skytrain, MRT	96.69	4	77	8,305,218	2010	National Statistical Office
Busan	0.903	296.5	Busan Metro	139.9	6	114	3,470,653	2018	Busan Metropolitan City
Chennai	0.640	58.6	Chennai Metro	35.3	2	26	4,646,732	2011	Indian Census
Daegu	0.903	54.5	Daegu Metro	81.2	3	89	2,501,673	2017	Statistics Korea
Daejeon	0.903	39.6	Daejeon Metro	22.7	1	22	1,522,288	2015	Statistics Korea
Delhi	0.640	293.6	Delhi Metro	296	8	214	11,034,555	2011	Indian Census
Fukuoka	0.909	193.3	Fukuoka Subway	29.8	3	35	1,578,920	2018	City of Fukuoka
Gwangju	0.903	36.7	Gwangju Metro	20.1	1	20	1,460,745	2018	Statistics Korea
Hanoi	0.694	42	Hanoi Metro	13.1	1	12	7,587,800	2017	General Statistics Office of Vietnam
Hiroshima	0.909	74.9	Amstram Line	18.4	1	21	1,195,327	2017	City of Hiroshima
Hong Kong	0.933	416	MTR	174.7	11	93	7,448,900	2018	Census and Statistics Department
Hyderabad	0.640	40.2	Hyderabad Metro	46.5	2	40	6,809,970	2011	Indian Census
Incheon	0.903	845.9	Incheon Subway	29.4	2	56	2,953,883	2018	Statistics Korea
Jakarta	0.694	321.3	Jakarta MRT	15.7	1	13	10,374,235	2017	Statistics Indonesia
Kaohsiung	0.907	113.6	Kaohsiung Rapid Transit	42.7	2	37	2,773,093	2018	Kaohsiung City Government
Kobe	0.909	671.3	Kobe Subway	30.6	2	26	1,530,368	2018	City of Kobe
Kolkata	0.640	60.4	Kolkata Metro	27.2	1	24	4,496,694	2011	Indian Census
Kuala Lumpur	0.802	171.8	Rapid KL	142.5	5	104	1,790,000	2017	Malaysia Department of Statistics
Kyoto	0.909	671.3	Kyoto Subway	31.2	2	31	1,468,980	2018	City of Kyoto
Lahore	0.562	40	Lahore Metro	27.1	1	26	11,126,285	2017	Pakistan Census - Bureau of Statistics
Lucknow	0.640	22	Lucknow Metro	22.8	1	22	2,817,105	2011	Indian Census
Manila	0.699	182.8	Manilla LRT & MRT	50.7	3	44	1,780,148	2015	Philippine Statistics Authority
Mumbai	0.640	150.8	Mumbai Metro	11.4	1	12	12,442,373	2011	Indian Census
Nagoya	0.909	363.8	Nagoya	93.3	6	87	2,311,132	2018	City of Nagoya
Nagpur	0.640	18	Nagpur Metro	38.2	2	40	2,497,870	2011	Indian Census
Osaka	0.909	671.3	Osaka Metro, Osaka Monorail	165.8	11	125	2,725,006	2018	City of Osaka
Sapporo	0.909	80.5	Sapporo Subway	48	3	49	1,965,940	2018	City of Sapporo
Sendai	0.909	75.3	Sendai Subway	28.7	2	30	1,088,669	2018	City of Sendai
Seoul	0.903	845.9	Seoul Subway	495.8	11	400	9,709,075	2018	Statistics Korea
Singapore	0.932	365.9	Singapore MRT	199.6	5	119	5,612,300	2017	Department of Statistics Singapore
Taipei	0.907	327.3	Taipei Metro	131.1	5	108	2,669,639	2018	Taiwan MoI - Dept. of Household Registration
Taoyuan	0.907	63	Taoyuan Metro	53.1	1	22	2,213,379	2018	Taoyuan City
Tokyo	0.909	1,617	Tokyo Subway, Tama Monorail, Tokyo Monorail, Rinkai, Yurikamome, JR Yamanote	399.3	18	276	13,839,910	2018	City of Tokyo Statistics
Yokohama	0.909	1,617	Yokohama Subway	57.5	3	46	3,740,172	2018	City of Yokohama

** Rapid Transit System descriptive data correct as of December 2018. All Human Development Index (HDI) scores and Gross Domestic Product (GDP) data from UN Development Program. "Human Development Indices and Indicators (2018)."*

Appendix B: List of Candidate Station

City	Name (English)	Station Grade	Long	Lat	Lines	Line Names	ADB	POI	Population
Bangkok	Ari	Elevated	100.5446	13.7797	1	Sukhumvit	12,610	95	1,852
Bangkok	Asok	Elevated	100.5603	13.7370	2	Sukhumvit; Blue (Sukhumvit)	92,302	275	3,302
Bangkok	Bang Chak	Elevated	100.6053	13.6968	1	Sukhumvit	8,084	16	2,594
Bangkok	Bang Na	Elevated	100.6047	13.6681	1	Sukhumvit	5,028	0	603
Bangkok	Bang Wa	Elevated	100.4578	13.7208	1	Silom	19,868	12	3,888
Bangkok	Bearing	Elevated	100.6018	13.6613	1	Sukhumvit	22,959	3	571
Bangkok	Chatuchak Park	Underground	100.5530	13.8021	2	Sukhumvit; Blue (Mo Chit)	61,784	26	2,060
Bangkok	Chit lom	Elevated	100.5430	13.7441	1	Sukhumvit	29,606	118	2,608
Bangkok	Chong Nonsi	Elevated	100.5293	13.7237	1	Silom	26,041	101	6,233
Bangkok	Ekkamai	Elevated	100.5851	13.7195	1	Sukhumvit	17,652	64	3,121
Bangkok	Hua Lamphong	Multiple	100.5172	13.7378	5	Blue; SRT - Northern, Northeastern, Southern, Eastern (Bangkok Railway Station)	104,997	87	8,371
Bangkok	Huai Khwang	Underground	100.5736	13.7785	1	Blue	17,543	32	3,253
Bangkok	Kamphaeng Phet	Underground	100.5476	13.7981	1	Blue	3,818	70	1,619
Bangkok	Khlong Toei	Underground	100.5539	13.7223	1	Blue	1,885	14	4,000
Bangkok	Krung Thon Buri	Elevated	100.5026	13.7209	1	Silom	10,529	16	5,474
Bangkok	Lat Phrao	Underground	100.5740	13.8057	1	Blue	17,393	5	2,979
Bangkok	Lumphini	Underground	100.5454	13.7258	1	Blue	11,072	27	3,205
Bangkok	Mo Chit	Elevated	100.5538	13.8026	2	Blue; Sukhumvit (Chatuchak)	61,784	19	2,162
Bangkok	Nana	Elevated	100.5554	13.7405	1	Sukhumvit	16,759	316	3,291
Bangkok	On Nut	Elevated	100.6010	13.7057	1	Sukhumvit	28,608	39	2,924
Bangkok	Phahon Yothin	Underground	100.5602	13.8142	1	Blue	17,426	69	2,066
Bangkok	Pho Nimit	Elevated	100.4859	13.7192	1	Silom	2,319	5	8,109
Bangkok	Phra Khanong	Elevated	100.5911	13.7152	1	Sukhumvit	12,646	60	3,065
Bangkok	Phra Ram 9	Underground	100.5653	13.7576	1	Blue	24,714	25	3,161
Bangkok	Phrom Phong	Elevated	100.5697	13.7305	1	Sukhumvit	30,755	112	3,295
Bangkok	Ploen Chit	Elevated	100.5490	13.7430	1	Sukhumvit	20,827	92	2,739
Bangkok	Punnawithi	Elevated	100.6090	13.6893	1	Sukhumvit	8,474	13	2,594
Bangkok	Queen Sirikit National Convention Centre	Underground	100.5601	13.7231	1	Blue	12,120	16	4,453
Bangkok	Ratchadamri	Elevated	100.5394	13.7394	1	Silom	5,305	6	2,068
Bangkok	Ratchadaphisek	Underground	100.5746	13.7991	1	Blue	4,857	9	3,495
Bangkok	Ratchathewi	Elevated	100.5316	13.7520	1	Sukhumvit	12,699	72	6,456
Bangkok	Sala Daeng	Elevated	100.5343	13.7285	1	Silom	33,810	194	4,834
Bangkok	Sam Yan	Underground	100.5300	13.7324	1	Blue	10,184	70	4,275
Bangkok	Sanam Pao	Elevated	100.5421	13.7726	1	Sukhumvit	4,409	7	1,852
Bangkok	Saphan Khwai	Elevated	100.5497	13.7938	1	Sukhumvit	9,515	18	1,859
Bangkok	Saphan Taksin	Elevated	100.5141	13.7188	1	Silom	19,556	56	7,220
Bangkok	Si Lom	Elevated	100.5365	13.7293	1	Blue	20,387	127	4,058
Bangkok	Siam	Elevated	100.5342	13.7456	2	Silom, Sukhumvit	64,559	202	1,464
Bangkok	Sukhumvit	Underground	100.5615	13.7385	1	Blue; Sukhumvit (Asok)	92,302	285	2,538
Bangkok	Surasak	Elevated	100.5214	13.7192	1	Silom	13,190	35	8,491
Bangkok	Sutthisan	Underground	100.5742	13.7897	1	Blue	12,645	36	3,464
Bangkok	Talat Phlu	Elevated	100.4768	13.7142	1	Silom	7,677	7	6,260
Bangkok	Thailand Cultural Centre	Underground	100.5702	13.7661	1	Blue	18,733	32	3,253

City	Name (English)	Station Grade	Long	Lat	Lines	Line Names	ADB	POI	Population
Bangkok	Thong Lo	Elevated	100.5785	13.7242	1	Sukhumvit	15,580	82	3,322
Bangkok	Udom Suk	Elevated	100.6095	13.6799	1	Sukhumvit	20,389	5	664
Bangkok	Wongwian Yai	Elevated	100.4951	13.7210	1	Silom	11,077	13	5,653
Bangkok	Wutthakat	Elevated	100.4689	13.7130	1	Silom	8,408	4	5,938
Manila	5th Avenue	Elevated	120.9836	14.6444	1	LRT-1	19,010	25	13,868
Manila	Abad Santos	Elevated	120.9813	14.6308	1	LRT-1	7,636	15	23,200
Manila	Anonas	Elevated	121.0647	14.6280	1	LRT-2	9,551	40	12,926
Manila	Araneta Center - Cubao (LRT2)	Elevated	121.0524	14.6226	1	LRT-2	25,109	133	13,459
Manila	Araneta Center - Cubao (MRT3)	Elevated	121.0509	14.6199	1	MRT-3	36,868	100	16,246
Manila	Ayala	Underground	121.0279	14.5492	1	MRT-3	31,361	61	2,505
Manila	Baclaran	Elevated	120.9984	14.5343	1	LRT-1	34,856	36	18,587
Manila	Bambang	Elevated	120.9825	14.6111	1	LRT-1	6,882	38	27,096
Manila	Betty Go - Belmonte	Elevated	121.0427	14.6186	1	LRT-2	2,588	9	6,680
Manila	Blumentritt	Multiple	120.9829	14.6226	3	LRT-1; PNR - Metro North Commuter, Metro South Commuter	27,700	20	21,608
Manila	Boni	At-Grade	121.0479	14.5735	1	MRT-3	19,309	87	17,782
Manila	Buendia	Underground	121.0346	14.5546	1	MRT-3	10,945	11	2,460
Manila	Carriedo	Elevated	120.9814	14.5991	1	LRT-1	28,778	185	9,003
Manila	Central Terminal	Elevated	120.9816	14.5928	1	LRT-1	18,467	13	3,830
Manila	Doroteo Jose	Elevated	120.9820	14.6054	1	LRT-1	29,117	57	38,188
Manila	EDSA	Elevated	121.0006	14.5390	2	LRT-1, MRT-3 (Taft Avenue)	124,793	41	17,786
Manila	Gil Puyat	Elevated	120.9971	14.5541	1	LRT-1	37,193	52	18,710
Manila	Gilmore	Elevated	121.0342	14.6135	1	LRT-2	5,295	43	6,905
Manila	Guadalupe	Underground	121.0456	14.5671	1	MRT-3	28,456	43	17,659
Manila	J. Ruiz	Elevated	121.0262	14.6105	1	LRT-2	2,982	62	17,567
Manila	Kamuning	Elevated	121.0434	14.6352	1	MRT-3	14,456	45	7,968
Manila	Katipunan	Underground	121.0729	14.6310	1	LRT-2	20,366	7	8,278
Manila	Legarda	Elevated	120.9926	14.6008	1	LRT-2	12,557	60	18,159
Manila	Libertad	Elevated	120.9986	14.5477	1	LRT-1	13,436	44	24,347
Manila	Monumento	Elevated	120.9839	14.6543	1	LRT-1	49,558	65	10,600
Manila	Ortigas	Elevated	121.0568	14.5879	1	MRT-3	13,904	31	2,232
Manila	Pedro Gil	Elevated	120.9881	14.5765	1	LRT-1	24,645	71	6,657
Manila	Pureza	Elevated	121.0052	14.6017	1	LRT-2	12,345	23	26,656
Manila	Quezon Avenue	Elevated	121.0384	14.6429	1	MRT-3	29,691	51	7,942
Manila	Quirino	Elevated	120.9916	14.5702	1	LRT-1	13,420	73	15,928
Manila	R. Papa	Elevated	120.9824	14.6360	1	LRT-1	7,421	4	18,597
Manila	Recto	Elevated	120.9835	14.6035	1	LRT-2	39,157	146	34,011
Manila	Roosevelt	Elevated	121.0212	14.6575	1	LRT-1	28,826	109	17,098
Manila	Santolan	Elevated	121.0860	14.6221	1	LRT-2	39,702	15	11,985
Manila	Santolan-Annapolis	Elevated	121.0566	14.6074	1	MRT-3	6,819	11	3,993
Manila	Shaw Boulevard	Elevated	121.0535	14.5810	1	MRT-3	32,509	113	7,489
Manila	Taft Avenue	At-Grade	121.0013	14.5376	2	MRT-3, LRT-1 (EDSA)	124,793	43	21,499
Manila	Tayuman	Elevated	120.9827	14.6167	1	LRT-1	17,986	31	18,262
Manila	United Nations	Elevated	120.9847	14.5825	1	LRT-1	29,173	72	2,961
Manila	V. Mapa	Elevated	121.0172	14.6041	1	LRT-2	11,082	115	17,472
Osaka	Abeno	Underground	135.5121	34.6429	1	Tanimachi	9,196	89	10,888

City	Name (English)	Station Grade	Long	Lat	Lines	Line Names	ADB	POI	Population
Osaka	Abiko	Underground	135.5128	34.5990	1	Midosuji	17,503	41	13,460
Osaka	Asashiobashi	Elevated	135.4487	34.6608	1	Chuo	10,467	12	7,849
Osaka	Awaza	Underground	135.4865	34.6812	2	Chuo; Sennichimae	23,983	47	10,738
Osaka	Banpaku-Kinen-Koen	Elevated	135.5301	34.8068	2	MONO - Main, Saito	10,793	4	345
Osaka	Bentencho	Elevated	135.4625	34.6691	2	Chuo; Kanjo	52,088	27	8,651
Osaka	Cosmosquare	Underground	135.4123	34.6426	2	Chuo; Nanko Port Town	11,749	9	970
Osaka	Daido-Toyosato	Underground	135.5445	34.7440	1	Imazatosuji	4,995	28	9,093
Osaka	Daikokucho	Underground	135.4979	34.6564	2	Midosuji; Yotsubashi	16,546	59	11,303
Osaka	Dainichi	Multiple	135.5786	34.7495	2	Tanimachi; MONO - Main	23,298	74	7,005
Osaka	Deto	Underground	135.5652	34.6090	1	Tanimachi	7,613	47	8,505
Osaka	Dobutsuen-mae	Underground	135.5038	34.6488	2	Midosuji; Saikaisuji	14,916	64	13,704
Osaka	Dome-mae Chiyozaki	Underground	135.4790	34.6704	2	Nagahoritsurumiryokuchi; MONO - Main	9,970	13	7,252
Osaka	Ebisucho	Underground	135.5056	34.6554	1	Saikaisuji	10,477	96	9,666
Osaka	Esaka	Elevated	135.4971	34.7588	1	Midosuji / Kitaosakakyuko	42,335	170	9,026
Osaka	Fukaebashi	Underground	135.5569	34.6792	1	Chuo	11,737	43	8,154
Osaka	Fuminosato	Underground	135.5182	34.6359	1	Tanimachi	5,751	25	9,659
Osaka	Gamo-yonchome	Underground	135.5465	34.7004	2	Nagahoritsurumiryokuchi; Imazatosuji	9,325	115	11,197
Osaka	Hanazonocho	Underground	135.4965	34.6442	1	Yotsubashi	7,892	121	12,599
Osaka	Handai-byoin-mae	Elevated	135.5297	34.8185	1	MONO - Saito	3,792	8	2,974
Osaka	Higashi-Mikuni	Elevated	135.4985	34.7411	1	Midosuji	18,488	74	10,910
Osaka	Higashi-Umeda	Underground	135.4998	34.7006	1	Tanimachi	84,199	357	688
Osaka	Higobashi	Underground	135.4964	34.6913	1	Yotsubashi	34,424	370	2,698
Osaka	Hirano	Underground	135.5487	34.6209	1	Tanimachi	11,097	21	7,352
Osaka	Hommachi	Underground	135.4990	34.6828	3	Chuo; Midosuji; Yotsubashi	107,111	284	1,839
Osaka	Hotarugaike	Elevated	135.4494	34.7941	2	MONO - Main; HANKYU - Takarakuza	33,102	15	5,086
Osaka	Imafuku-Tsurumi	Underground	135.5604	34.7021	1	Nagahoritsurumiryokuchi	11,654	48	10,655
Osaka	Imazato	Underground	135.5430	34.6692	2	Imazatosuji; Sennichimae	11,434	98	9,741
Osaka	Itakano	Underground	135.5473	34.7601	1	Imazatosuji	3,622	10	7,665
Osaka	Kadoma-minami	Underground	135.5925	34.7168	1	Nagahoritsurumiryokuchi	5,542	1	2,336
Osaka	Kadoma-shi	Elevated	135.5826	34.7374	2	MONO - Main; KEIHAN - Main Line	26,406	111	7,971
Osaka	Kire-Uriwari	Underground	135.5519	34.6092	1	Tanimachi	10,957	13	9,506
Osaka	Kishinosato	Underground	135.4938	34.6343	1	Yotsubashi	8,497	24	9,420
Osaka	Kitahama	Underground	135.5066	34.6911	2	Sakaisuji; KEIHAN - Main Line	51,474	143	2,854
Osaka	Kitahanada	Underground	135.5164	34.5824	1	Midosuji	12,153	9	5,954
Osaka	Kitakagaya	Underground	135.4793	34.6213	1	Yotsubashi	12,451	13	9,391
Osaka	Kita-Tatsumi	Underground	135.5550	34.6533	1	Sennichimae	6,770	111	6,873
Osaka	Koen-higashiguchi	Elevated	135.5396	34.8107	1	MONO - Saito	760	1	258
Osaka	Komagawa-Nakano	Underground	135.5328	34.6215	1	Tanimachi	8,685	95	8,360
Osaka	Kujo	Elevated	135.4735	34.6752	2	Chuo; HANSHIN - Hanshin Namba	18,071	140	8,920
Osaka	Kyobashi	Underground	135.5339	34.6968	5	Nagahoritsurumiryokuchi; JR - Kanjo, Tozai, Gakkenoshi KEIHAN - Main Line	239,697	110	5,263
Osaka	Matsuyamachi	Underground	135.5125	34.6755	1	Nagahoritsurumiryokuchi	5,734	66	13,026
Osaka	Midoribashi	Underground	135.5446	34.6808	2	Chuo; Imazatosuji	11,201	92	10,516
Osaka	Minami Settsu	Elevated	135.5686	34.7653	1	MONO - Main	4,818	3	2,934
Osaka	Minami-Ibaraki	Elevated	135.5651	34.8026	2	MONO - Main; HANKYU - Kyoto	36,934	68	7,203
Osaka	Minami-morimachi	Underground	135.5110	34.6976	2	Tanimachi; Saikaisuji	42,122	399	9,049

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Osaka	Minami-Tatsumi	Underground	135.5532	34.6430	1	Sennichimae	6,770	78	7,681
Osaka	Miyakojima	Underground	135.5260	34.7090	1	Tanimachi	18,400	183	9,432
Osaka	Moriguchi	Underground	135.5643	34.7384	1	Tanimachi	8,674	83	7,950
Osaka	Morinomiya	Underground	135.5334	34.6815	3	Nagahoritsurumiryokuchi; Chuo; JR - Kanjo	41,444	46	4,320
Osaka	Nagahara	Underground	135.5737	34.6026	1	Tanimachi	5,637	37	8,022
Osaka	Nagahoribashi	Underground	135.5063	34.6748	2	Nagahoritsurumiryokuchi; Saikaisuji	25,638	158	6,225
Osaka	Nagai	Underground	135.5138	34.6102	2	Midosuji; JR - Hanwa	21,290	42	7,544
Osaka	Nagata	Underground	135.5920	34.6788	2	Chuo / KINTETSU - Keihanna	24,328	26	3,720
Osaka	Nakamozu	Underground	135.5063	34.5563	3	Midosuji; NANKAI - Nankai Koya; SEMBOKU - Semboku	107,056	85	7,529
Osaka	Nakatsu	Underground	135.4971	34.7114	1	Midosuji	20,301	131	5,247
Osaka	Nakazakicho	Underground	135.5056	34.7072	1	Tanimachi	7,215	191	11,615
Osaka	Namba	Underground	135.4993	34.6662	5	Midosuji; Sennichimae; Yotsubashi; KINTETSU - Namba; HANSHIN - Namba	306,597	417	3,165
Osaka	Nippombashi	Underground	135.5062	34.6670	3	Saikaisuji; Sennichimae; KINTETSU - Nara	61,997	447	6,604
Osaka	Nishi-Nagahori	Underground	135.4871	34.6745	2	Nagahoritsurumiryokuchi; Sennichimae	13,747	54	12,584
Osaka	Nishinakajima-Minamigata	Elevated	135.4986	34.7265	2	Midosuji; HANKYU - Kyoto	56,465	122	4,029
Osaka	Nishiohashi	Underground	135.4937	34.6755	1	Nagahoritsurumiryokuchi	7,035	103	12,031
Osaka	Nishitanabe	Underground	135.5152	34.6215	1	Midosuji	11,515	35	7,922
Osaka	Nishi-Umeda	Underground	135.4956	34.6994	3	Yotsubashi; HANSHIN - Main (Hanshin Umeda); JR - Tozai (Kita-sinchi)	196,753	298	371
Osaka	Nodahanshin	Underground	135.4749	34.6941	3	Sennichimae; HANSHIN - Main (Noda); JR -Tozai (Ebie)	40,138	22	10,488
Osaka	Noe-Uchindai	Underground	135.5382	34.7090	1	Tanimachi	5,941	55	10,496
Osaka	Ogimachi	Underground	135.5108	34.7039	1	Saikasuji	7,639	245	8,822
Osaka	Osaka Business Park	Underground	135.5297	34.6919	1	Nagahoritsurumiryokuchi	6,231	52	1,088
Osaka	Saito-Nishi	Elevated	135.5228	34.8552	1	MONO - Saito	9,366	11	3,338
Osaka	Sakaisuji-Hommachi	Underground	135.5067	34.6819	2	Chuo; Sakaisuji	53,494	139	3,208
Osaka	Sakuragawa	Underground	135.4903	34.6683	2	Sennichi; HANSHIN - Hanshin Namba	11,345	61	12,456
Osaka	Sawaragi	Elevated	135.5657	34.7932	1	MONO - Main	1,829	13	3,186
Osaka	Sekime-Seiiku	Underground	135.5464	34.7130	2	Imazatosuji; KEIHAN - Main	10,901	91	10,906
Osaka	Sekime-Takadono	Underground	135.5455	34.7152	1	Tanimachi	7,783	85	9,985
Osaka	Sembayashi-Omiya	Underground	135.5493	34.7243	1	Tanimachi	8,335	90	9,016
Osaka	Senri-Chuo	Elevated	135.4953	34.8075	2	MONO - Main; KITA OSAKA KYUKO - Namboku	67,163	53	5,982
Osaka	Settsu	Elevated	135.5614	34.7801	1	MONO - Main	2,550	3	2,695
Osaka	Shibahara	Elevated	135.4587	34.8004	1	MONO - Main	4,810	3	4,869
Osaka	Shigino	Underground	135.5461	34.6929	3	Imazatosuji; JR - Kanjo; Gakkentoshi	14,757	110	9,399
Osaka	Shimizu	Underground	135.5608	34.7222	1	Imazatosuji	2,968	21	9,119
Osaka	Shimmori-Furuichi	Underground	135.5583	34.7153	1	Imazatosuji	3,800	33	9,843
Osaka	Shin-Fukae	Underground	135.5542	34.6682	1	Sennichimae	6,409	62	9,380
Osaka	Shinkanaoka	Underground	135.5153	34.5682	1	Midosuji	10,700	20	6,713
Osaka	Shin-Osaka	Elevated	135.5000	34.7335	5	Midosuji; JR - Tokaido Shinkansen; Sanyo Shinkansen; Kyoto; Osaka East Line	216,021	42	6,002
Osaka	Shinsaibashi	Underground	135.5004	34.6751	2	Nagahoritsurumiryokuchi; Midosuji;	86,003	357	3,049
Osaka	Shitennoji-mae Yuhigaoka	Underground	135.5142	34.6585	1	Tanimachi	12,535	33	7,709
Osaka	Shoji	Underground	135.5563	34.6615	1	Sennichimae	4,284	90	9,188
Osaka	Shoji (monorail)	Elevated	135.4754	34.8043	1	MONO - Main	6,114	4	5,854
Osaka	Showacho	Underground	135.5169	34.6330	1	Midosuji	12,713	28	10,217
Osaka	Suminoekoen	Multiple	135.4731	34.6092	2	Yotsubashi; Nanko Port Town	15,531	16	3,445
Osaka	Taishibashi-Imaichi	Underground	135.5557	34.7319	2	Imazatosuji; Tanimachi	6,913	102	7,217

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Osaka	Taisho	Underground	135.4789	34.6659	2	Nagahoritsurumiryokuchi; JR - Kanjo	30,811	54	7,309
Osaka	Takaida	Underground	135.5723	34.6785	2	Chuo; JR - Osaka Higashi Line	12,904	9	4,597
Osaka	Tamade	Underground	135.4905	34.6241	1	Yotsubashi	10,023	20	9,563
Osaka	Tamagawa	Underground	135.4764	34.6892	2	Sennichimae; JR - Kanjo (Noda)	17,664	26	9,530
Osaka	Tamatsukuri	Underground	135.5316	34.6744	1	Nagahoritsurumiryokuchi	7,553	28	9,396
Osaka	Tanabe	Underground	135.5252	34.6286	1	Tanimachi	4,808	9	9,143
Osaka	Tanimachi-Kyuchome	Underground	135.5157	34.6666	4	Tanimachi; Sennichimae; KINTETSU - Namba, Osaka (Osaka Uehonmachi)	72,951	109	9,588
Osaka	Tanimachi-Rokuchome	Underground	135.5171	34.6760	2	Nagahoritsurumiryokuchi; Tanimachi	17,466	74	14,507
Osaka	Tanimachi-Yonchome	Underground	135.5173	34.6817	2	Chuo; Tanimachi	45,809	108	7,074
Osaka	Temmabashi	Underground	135.5173	34.6902	3	Tanimachi; KEIHAN - Main, Nakanoshima	77,173	86	5,498
Osaka	Tengachaya	Underground	135.4969	34.6372	3	Saikaisuji; NANKAI - Koya; Main	74,568	22	9,947
Osaka	Tenjimbashisuji Rokuchome	Underground	135.5107	34.7108	3	Tanimachi; Saikaisuji; HANKYU - Senri	28,499	240	13,691
Osaka	Tennoji	Underground	135.5150	34.6467	6	Tanimachi; Midosuji; JR - Kanjo, Yamatoji, Hanwa; KINTETSU - Minami Osaka (Osaka Abenobashi)	371,987	137	5,453
Osaka	Toyokawa	Elevated	135.5267	34.8346	1	MONO - Main	1,634	1	1,802
Osaka	Tsuruhashi	Underground	135.5302	34.6653	4	Sennichimae; JR - Kanjo; KINTETSU - Nara, Osaka	201,838	104	9,460
Osaka	Tsurumi-ryokuchi	Underground	135.5807	34.7110	1	Nagahoritsurumiryokuchi	5,019	11	3,645
Osaka	Umeda	Underground	135.4977	34.7032	9	Midosuji; HANSHIN - Main (Hanshin Umeda); HANKYU - Kobe, Kyoto, Takarakuza; JR - Kyoto, Kobe, Kanjo, Fukuchiyama (Osaka)	1,093,344	412	403
Osaka	Unobe	Elevated	135.5545	34.8080	1	MONO - Main	3,886	8	4,318
Osaka	Yamada	Elevated	135.5158	34.8056	1	MONO - Main	9,168	32	5,745
Osaka	Yaominami	At-grade	135.5828	34.5972	1	Tanimachi	5,707	12	2,796
Osaka	Yokozutsumi	Underground	135.5727	34.7035	1	Nagahoritsurumiryokuchi	9,264	28	9,523
Osaka	Zuiko Yonchome	Underground	135.5445	34.7521	1	Imazatosuji	4,903	23	8,350
Taipei	Banqiao	Underground	121.4638	25.0146	3	Bannan; THSR; TR - West Coast Line	74,005	83	12,191
Taipei	Beitou	Elevated	121.4986	25.1319	2	Tamsui-Xinyi, Xinbeitou	16,859	64	9,998
Taipei	Cailiao	Underground	121.4915	25.0599	1	Zhonghe-Xinlu	9,449	25	21,913
Taipei	Chiang Kai-Shek Memorial Hall	Underground	121.5175	25.0337	2	Tamsui-Xinyi, Songshan-Xindian	28,994	129	12,897
Taipei	Daan	Multiple	121.5436	25.0334	2	Tamsui-Xinyi, Wenhu	23,530	147	17,599
Taipei	Daan Park	Underground	121.5354	25.0336	1	Tamsui-Xinyi	8,957	86	12,977
Taipei	Dahu Park	Elevated	121.6022	25.0838	1	Wenhu	3,380	19	4,463
Taipei	Danfeng	Underground	121.4225	25.0289	1	Zhonghe-Xinlu	9,098	14	10,853
Taipei	Dapinglin	Underground	121.5413	24.9829	1	Songshan-Xindian	20,443	202	15,761
Taipei	Daqiaotou	Underground	121.5129	25.0632	1	Zhonghe-Xinlu	13,480	60	14,780
Taipei	Dazhi	Underground	121.5472	25.0798	1	Wenhu	9,124	89	10,632
Taipei	Dingpu	Underground	121.4186	24.9592	1	Bannan	8,113	11	2,262
Taipei	Dingxi	Underground	121.5154	25.0134	1	Zhonghe-Xinlu	35,005	73	23,318
Taipei	Donghu	Elevated	121.6116	25.0675	1	Wenhu	7,836	78	15,725
Taipei	Dongmen	Underground	121.5286	25.0339	2	Tamsui-Xinyi, Zhonghe-Xinlu	24,609	201	22,371
Taipei	Far Eastern Hospital	Underground	121.4526	24.9985	1	Bannan	22,247	20	7,974
Taipei	Fu Jen University	Underground	121.4359	25.0328	1	Zhonghe-Xinlu	10,652	52	1,393
Taipei	Fuxinggang	At-Grade	121.4854	25.1375	1	Tamsui-Xinyi	3,507	6	2,750
Taipei	Fuzhong	Underground	121.4592	25.0087	1	Bannan	30,547	125	13,093
Taipei	Gangqian	Elevated	121.5753	25.0800	1	Wenhu	14,071	61	11,876
Taipei	Gongguan	Underground	121.5343	25.0148	1	Songshan-Xindian	29,698	464	4,013
Taipei	Guandu	At-Grade	121.4670	25.1255	1	Tamsui-Xinyi	11,626	14	2,087

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Taipei	Guting	Underground	121.5227	25.0268	2	Songshan-Xindian; Zhonghe-Xinlu	31,217	140	22,637
Taipei	Haishan	Underground	121.4488	24.9857	1	Bannan	20,710	30	17,880
Taipei	Houshanpi	Underground	121.5823	25.0447	1	Bannan	16,244	102	18,855
Taipei	Huilong	Underground	121.4119	25.0222	1	Zhonghe-Xinlu	9745	21	10,509
Taipei	Huzhou	Elevated	121.6075	25.0726	1	Wenhu	7,684	113	13,468
Taipei	Jiangzicui	Underground	121.4727	25.0304	1	Bannan	24,687	59	15,107
Taipei	Jiannan Road	Elevated	121.5558	25.0848	1	Wenhu	11,141	27	4,247
Taipei	Jiantan	Elevated	121.5250	25.0843	1	Tamsui-Xinyi	34,617	130	8,532
Taipei	Jingan	Underground	121.5050	24.9934	1	Zhonghe-Xinlu	24,641	120	23,234
Taipei	Jingmei	Underground	121.5408	24.9930	1	Songshan-Xindian	16,460	418	16,206
Taipei	Kunyang	Underground	121.5933	25.0505	1	Bannan	12,984	29	4,639
Taipei	Linguang	Elevated	121.5589	25.0185	1	Wenhu	4,251	11	10,527
Taipei	Liuzhangli	Elevated	121.5532	25.0237	1	Wenhu	11,013	127	16,131
Taipei	Longshan Temple	Underground	121.5008	25.0352	1	Bannan	30,910	106	17,146
Taipei	Luzhou	Underground	121.4646	25.0915	1	Zhonghe-Xinlu	13,225	7	7,623
Taipei	Mingde	Elevated	121.5188	25.1098	1	Tamsui-Xinyi	12,094	22	17,584
Taipei	Minquan West Road	Underground	121.5193	25.0629	2	Tamsui-Xinyi, Zhonghe-Xinlu	23,286	88	14,742
Taipei	Muzha	Elevated	121.5732	24.9983	1	Wenhu	4,062	10	4,275
Taipei	Nangang	Underground	121.6072	25.0522	3	Bannan; THSR; TR - West Coast Line	33,940	23	3,462
Taipei	Nangang Software Park	Elevated	121.6159	25.0599	1	Wenhu	4,593	32	3,660
Taipei	Nanjing Fuxing	Multiple	121.5440	25.0519	2	Songshan-Xindian; Wenhu	35,475	256	13,622
Taipei	Nanjing Sanmin	Underground	121.5638	25.0514	1	Songshan-Xindian	21,765	148	22,209
Taipei	Nanshijiao	Underground	121.5090	24.9900	1	Zhonghe-Xinlu	21,192	55	21,736
Taipei	Neihu	Elevated	121.5945	25.0837	1	Wenhu	8,657	292	14,623
Taipei	NTU Hospital	Underground	121.5163	25.0421	1	Tamsui-Xinyi	21,669	218	2,960
Taipei	Qilian	Elevated	121.5065	25.1208	1	Tamsui-Xinyi	7,491	15	8,742
Taipei	Qiyan	Elevated	121.5011	25.1256	1	Tamsui-Xinyi	9,125	14	7,465
Taipei	Qizhang	Underground	121.5429	24.9759	2	Songshan-Xindian, Xiaobitan	16,175	116	20,611
Taipei	Sanchong Elementary School	Underground	121.4966	25.0705	1	Zhonghe-Xinlu	11,561	127	21,059
Taipei	Sanhe Junior High School	Underground	121.4865	25.0768	1	Zhonghe-Xinlu	11,982	15	21,997
Taipei	Sanmin Senior High School	Underground	121.4731	25.0856	1	Zhonghe-Xinlu	11,843	26	18,449
Taipei	Shandao Temple	Underground	121.5240	25.0447	1	Bannan	20,560	105	6,416
Taipei	Shilin	Elevated	121.5262	25.0935	1	Tamsui-Xinyi	28,807	344	8,172
Taipei	Shipai	Elevated	121.5158	25.1142	1	Tamsui-Xinyi	29,304	54	21,828
Taipei	Shuanglian	Underground	121.5206	25.0576	1	Tamsui-Xinyi	21,330	202	17,608
Taipei	Songjiang Nanjing	Underground	121.5330	25.0521	2	Zhonghe-Xinlu, Songshan-Xindian	33,364	533	10,636
Taipei	Songshan	Underground	121.5775	25.0501	2	Songshan-Xindian; TR - West Coast Line	40,337	53	13,739
Taipei	St. Ignatius High School	Underground	121.4802	25.0804	1	Zhonghe-Xinlu	11,573	27	21,116
Taipei	Sun Yat-Sen Memorial Hall	Underground	121.5574	25.0414	1	Bannan	21,326	176	13,002
Taipei	Taipei 101 / World Trade Center	Underground	121.5634	25.0329	1	Tamsui-Xinyi	31,672	126	9,936
Taipei	Taipei Arena	Underground	121.5523	25.0517	1	Songshan-Xindian	21,976	90	16,071
Taipei	Taipei Bridge	Underground	121.5002	25.0631	1	Zhonghe-Xinlu	9,431	67	21,931
Taipei	Taipei City Hall	Underground	121.5662	25.0411	1	Bannan	60,749	107	9,774
Taipei	Taipei Main	Underground	121.5175	25.0462	4	Tamsui-Xinyi, Bannan; THSR; TR - West Coast Line	260,835	335	4,566
Taipei	Taipei Nangang Exhibition Center	Multiple	121.6178	25.0551	2	Wenhu, Bannan	28,922	75	5,696

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Taipei	Taipei Zoo	Elevated	121.5795	24.9983	1	Wenhu	7,781	3	1,339
Taipei	Taipower Building	Underground	121.5283	25.0206	1	Songshan-Xindian	18,380	230	15,851
Taipei	Technology Building	Elevated	121.5435	25.0260	1	Wenhu	14,087	252	25,061
Taipei	Touqianzhuang	Underground	121.4605	25.0393	1	Zhonghe-Xinlu	4,901	7	7,453
Taipei	Tucheng	Underground	121.4444	24.9732	1	Bannan	7,101	8	7,554
Taipei	Wanfang Community	Elevated	121.5681	24.9986	1	Wenhu	2,445	9	7,365
Taipei	Wanfang Hospital	Elevated	121.5581	24.9994	1	Wenhu	13,093	157	4,975
Taipei	Wanlong	Underground	121.5390	25.0019	1	Songshan-Xindian	9,726	251	17,161
Taipei	Wende	Elevated	121.5852	25.0786	1	Wenhu	5,283	21	10,999
Taipei	Xiangshan	Underground	121.5700	25.0329	1	Tamsui-Xinyi	12,274	25	8,628
Taipei	Xianse Temple	Underground	121.4714	25.0463	1	Zhonghe-Xinlu	4,308	6	2,451
Taipei	Xiaobitan	Elevated	121.5309	24.9716	1	Xiaobitan	2,332	15	8,702
Taipei	Xiaonanmen	Underground	121.5108	25.0359	1	Songshan-Xindian	8,932	48	4,323
Taipei	Xihu	Elevated	121.5670	25.0822	1	Wenhu	14,455	113	7,957
Taipei	Ximen	Underground	121.5085	25.0421	2	Bannan; Songshan-Xindian	74,399	341	9,383
Taipei	Xinbeitou	Elevated	121.5034	25.1370	1	Xinbeitou	6,461	40	12,046
Taipei	Xindian	Underground	121.5377	24.9582	1	Songshan-Xindian	12,948	141	4,691
Taipei	Xindian District Office	Underground	121.5415	24.9677	1	Songshan-Xindian	10,608	80	12,772
Taipei	Xingtian Temple	Underground	121.5332	25.0592	1	Zhonghe-Xinlu	26,411	184	16,131
Taipei	Xinhai	Elevated	121.5570	25.0053	1	Wenhu	3,071	6	5,139
Taipei	Xinpu	Underground	121.4682	25.0233	1	Bannan	39,657	77	25,606
Taipei	Xinyi Anhe	Underground	121.5529	25.0332	1	Tamsui-Xinyi	16,639	189	22,370
Taipei	Xinzhuang	Underground	121.4525	25.0362	1	Zhonghe-Xinlu	10,310	89	13,605
Taipei	Yongan Market	Underground	121.5108	25.0024	1	Zhonghe-Xinlu	25,767	29	23,949
Taipei	Yongchun	Underground	121.5761	25.0408	1	Bannan	18,943	106	25,644
Taipei	Yongning	Underground	121.4363	24.9669	1	Bannan	12,455	17	921
Taipei	Yuanshan	Elevated	121.5201	25.0712	1	Tamsui-Xinyi	27,670	28	9,594
Taipei	Zhishan	Elevated	121.5225	25.1029	1	Tamsui-Xinyi	23,001	159	10,889
Taipei	Zhongshan	Underground	121.5204	25.0527	2	Tamsui-Xinyi, Songshan-Xindian	39,807	256	14,188
Taipei	Zhongshan Elementary School	Underground	121.5265	25.0627	1	Zhonghe-Xinlu	16,573	141	18,244
Taipei	Zhongshan Junior High School	Elevated	121.5442	25.0608	1	Wenhu	14,179	77	18,385
Taipei	Zhongxiao Dunhua	Underground	121.5504	25.0415	1	Bannan	36,012	299	18,963
Taipei	Zhongxiao Fuxing	Multiple	121.5437	25.0412	2	Wenhu, Bannan	48,653	190	15,207
Taipei	Zhongxiao Xinsheng	Underground	121.5329	25.0424	2	Bannan, Zhonghe-Xinlu	32,664	240	9,811
Taipei	Zhongyi	At-Grade	121.4734	25.1310	1	Tamsui-Xinyi	2,792	5	1,465
Taipei	Zhuwei	At-Grade	121.4595	25.1369	1	Tamsui-Xinyi	9,097	76	6,363
Tokyo	Akabane-iwabuchi	Underground	139.7222	35.7833	2	Namboku; Saitama Rapid Railway	90,567	9,356	53
Tokyo	Akabanebashi	Underground	139.7442	35.6550	1	Oedo	20,392	7,080	74
Tokyo	Akasaka	Underground	139.7365	35.6722	1	Chiyoda	47,381	6,149	190
Tokyo	Akasaka-mitsuke	Underground	139.7373	35.6768	2	Ginza; Marunouchi	65,148	2,100	105
Tokyo	Akebonobashi	Underground	139.7225	35.6923	1	Shinjuku	19,245	10,751	47
Tokyo	Akihabara	Multiple	139.7733	35.6983	5	Hibiya; JR - Yamanote, Keihin-Tohoku, Chuo-Sobu; Tsukuba Express	378,633	3,168	522
Tokyo	Aoyama-itchome	Underground	139.7241	35.6728	3	Ginza, Hanzomon, Oedo	97,594	3,790	75
Tokyo	Ariake-tennis-no-mori	Elevated	139.7889	35.6400	1	Yurikakome	1,937	3,817	1
Tokyo	Asakusa	Multiple	139.7972	35.7098	3	Asakusa, Ginza; TOBU - Tobu Skytree	104,964	7,938	169

City	Name (English)	Station Grade	Long	Lat	Lines	Line Names	ADB	POI	Population
Tokyo	Asakusabashi	Multiple	139.7861	35.6973	2	Asakusa; JR - Chuo-Sobu	84,934	8,636	237
Tokyo	Awajicho	Underground	139.7675	35.6949	2	Marunochi, Shinjuku (Ogawamachi)	66,169	4,364	260
Tokyo	Ayase	Elevated	139.8248	35.7622	2	Chiyoda; JR - Joban	239,663	8,402	45
Tokyo	Azabu-juban	Underground	139.7370	35.6561	2	Namboku, Oedo	44,045	10,442	96
Tokyo	Bakuro-yokoyama	Underground	139.7829	35.6920	3	Shinjuku, Asakusa (Higashi-Nihonbashi); JR - Sobu (Bakurocho)	125,132	9,794	92
Tokyo	Baraki-nakayama	Elevated	139.9420	35.7034	1	Tozai	13,518	7,818	11
Tokyo	Chikatetsu-akatsuka	Underground	139.6440	35.7700	2	Yurakucho, Fukutoshin	19,175	9,277	87
Tokyo	Chikatetsu-narimasu	Underground	139.6311	35.7768	2	Yurakucho, Fukutoshin	25,937	10,916	85
Tokyo	Chuo-daigaku-meisei-daigaku	At-Grade	139.4087	35.6419	1	Tama Toshi Monorail	17,367	2,239	14
Tokyo	Daiba	Elevated	139.7714	35.6259	1	Yurikakome	11,690	1,595	23
Tokyo	Daimon	Underground	139.7547	35.6568	2	Asakusa, Oedo	120,733	4,139	171
Tokyo	Ebisu	Multiple	139.7095	35.6471	4	Hibiya; JR - Yamanote, Shonan-Shinjuku, Yamanote	203,505	8,688	194
Tokyo	Edogawabashi	Underground	139.7340	35.7093	1	Yurakucho	26,762	11,603	155
Tokyo	Funabori	Elevated	139.8639	35.6838	1	Shinjuku	31,709	10,052	50
Tokyo	Gaiemmae	Underground	139.7179	35.6704	1	Ginza	39,893	2,545	259
Tokyo	Ginza	Underground	139.7642	35.6720	3	Ginza, Marunouchi, Hibiya	132,745	839	359
Tokyo	Ginza-itchome	Underground	139.7670	35.6744	1	Yurakucho	18,978	1,898	252
Tokyo	Gokokuji	Underground	139.7274	35.7192	1	Yurakucho	22,342	8,142	14
Tokyo	Gotanda	Multiple	139.7236	35.6263	3	Asakusa; JR - Yamanote; TOKYU - Tokyu Ikegami	230,174	8,663	162
Tokyo	Gyotoku	Elevated	139.9142	35.6826	1	Tozai	28,652	9,801	50
Tokyo	Hakusan	Underground	139.7522	35.7214	1	Mita	25,744	11,507	78
Tokyo	Hamacho	Underground	139.7882	35.6886	1	Shinjuku	11,060	10,821	29
Tokyo	Hamamatsucho	Multiple	139.7569	35.6556	3	MONO - Tokyo Monorail; JR - Yamanote, Keihin-Tohoku	215,878	3,946	160
Tokyo	Hanzomon	Underground	139.7417	35.6854	1	Hanzomon	44,816	6,050	140
Tokyo	Harajuku	At-Grade	139.7027	35.6713	1	JR - Yamanote	74,353	2,185	104
Tokyo	Hasune	Elevated	139.6791	35.7841	1	Mita	9,877	11,374	22
Tokyo	Hatchobori	Underground	139.7770	35.6746	2	Hibiya; JR - Keiyo	90,536	8,224	125
Tokyo	Heiwadai	Underground	139.6543	35.7577	2	Fukutoshin, Yurakucho	21,956	7,072	35
Tokyo	Higashi-ginza	Underground	139.7671	35.6696	2	Asakusa, Hibiya	86,643	1,791	219
Tokyo	Higashi-ikebukuro	Underground	139.7188	35.7260	1	Yurakucho	21,729	8,318	69
Tokyo	Higashi-koenji	Underground	139.6582	35.6980	1	Marunouchi	18,173	12,052	110
Tokyo	Higashi-nakano	At-Grade	139.6831	35.7065	2	Oedo; JR - Chuo-Sobu	54,521	11,526	173
Tokyo	Higashi-nihombashi	Underground	139.7848	35.6921	2	Asakusa, Shinjuku (Bakuroyokoyama)	99,348	10,074	68
Tokyo	Higashi-ojima	Elevated	139.8474	35.6899	1	Shinjuku	16,334	5,802	20
Tokyo	Higashi-shinjuku	Underground	139.7076	35.6983	2	Fukutoshin, Oedo	42,178	11,220	91
Tokyo	Hikarigaoka	Underground	139.6292	35.7585	1	Oedo	31,468	12,368	36
Tokyo	Hikawadai	Underground	139.6654	35.7496	2	Yurakucho, Fukutoshin	20,088	9,304	24
Tokyo	Hiroo	Underground	139.7222	35.6516	1	Hibiya	31,630	7,651	137
Tokyo	Hodokubo	Elevated	139.4108	35.6553	1	Tama Toshi Monorail	846	4,655	3
Tokyo	Hon-komagome	Underground	139.7538	35.7244	1	Namboku	11,666	10,548	67
Tokyo	Honancho	Underground	139.6579	35.6835	1	Maranouchi	18,652	10,390	60
Tokyo	Hongo-sanchome	Underground	139.7604	35.7071	2	Maranouchi, Oedo	39,034	8,679	352
Tokyo	Honjo-azumabashi	Underground	139.8045	35.7086	1	Asakusa	9,677	9,736	36
Tokyo	Ichigaya	Multiple	139.7359	35.6915	4	Shinjuku, Namboku, Yurakucho; JR - Chuo-Sobu	185,128	5,902	90
Tokyo	Ichinoe	Underground	139.8829	35.6859	1	Shinjuku	21,941	7,895	11

City	Name (English)	Station Grade	Long	Lat	Lines	Line Names	ADB	POI	Population
Tokyo	Iidabashi	Multiple	139.7450	35.7024	5	Namboku, Oedo, Tozai, Yurakucho; JR - Chuo-Sobu	192,471	4,545	363
Tokyo	Ikebukuro	Multiple	139.7112	35.7301	8	Yurakucho, Fukutoshin, Marunouchi; JR - Saikyo, Yamanote, Shonan-Shinju; TOBU - Tojo; SEIBU - Seibu Ikebukro	1,333,588	3,711	255
Tokyo	Inaricho	Underground	139.7822	35.7114	1	Ginza	8,589	9,155	195
Tokyo	Iriya	Underground	139.7846	35.7207	1	Hibiya	16,921	15,716	74
Tokyo	Itabashi-honcho	Underground	139.7056	35.7611	1	Mita	17,737	12,472	30
Tokyo	Itabashi-kuyakushomae	Underground	139.7102	35.7514	1	Mita	17,380	12,394	89
Tokyo	Iwamotocho	Underground	139.7753	35.6956	1	Shinjuku	26,844	4,603	216
Tokyo	Izumi-taiikukan	Elevated	139.4196	35.7188	1	Tama Toshi Monorail	3,315	2,453	10
Tokyo	Jimbocho	Underground	139.7582	35.6960	3	Mita, Shinjuku, Hanzomon	188,736	4,130	420
Tokyo	Kachidoki	Underground	139.7772	35.6590	1	Oedo	51,197	15,570	55
Tokyo	Kagurazaka	Underground	139.7346	35.7039	1	Tozai	20,162	12,392	201
Tokyo	Kamikitadai	Elevated	139.4159	35.7458	1	Tama Toshi Monorail	6,530	3,698	21
Tokyo	Kamiyacho	Underground	139.7447	35.6626	1	Hibiya	49,751	3,880	106
Tokyo	Kanamecho	Underground	139.6983	35.7332	2	Fukutoshin, Yurakucho	20,496	11,734	33
Tokyo	Kanda	Multiple	139.7711	35.6924	4	Ginza; JR - Yamanote, Keihin-Tohoku, Chuo	134,491	3,684	196
Tokyo	Kasai	Elevated	139.8726	35.6636	1	Tozai	53,288	12,846	109
Tokyo	Kasuga	Underground	139.7535	35.7086	4	Mita, Oedo;, Marunouchi (Korakuen), Namboku (Korakuen)	117,314	9,880	127
Tokyo	Kasumigaseki	Underground	139.7522	35.6735	3	Chiyoda, Hibiya, Marunouchi	75,897	65	76
Tokyo	Kayabacho	Underground	139.7801	35.6798	2	Hibiya, Tozai	65,868	5,255	70
Tokyo	Kiba	Underground	139.8071	35.6694	1	Tozai	38,225	8,714	30
Tokyo	Kikukawa	Underground	139.8061	35.6884	1	Shinjuku	12,765	12,404	39
Tokyo	Kinshicho	Multiple	139.8150	35.6970	3	Hanzomon; JR - Chuo-Sobu, Sobu	157,942	7,957	179
Tokyo	Kita-ayase	Elevated	139.8321	35.7769	1	Chiyoda	15,625	6,095	32
Tokyo	Kita-sando	Underground	139.7055	35.6785	1	Fukutoshin	11,986	4,932	57
Tokyo	Kita-senju	Multiple	139.8051	35.7495	4	Chiyoda, Hibiya; JR - Joban; TOBU - Skytree	741,524	7,506	141
Tokyo	Kiyosumi-shirakawa	Underground	139.7988	35.6821	2	Hanzomon, Oedo	48,483	9,163	35
Tokyo	Kodenmacho	Underground	139.7785	35.6908	1	Hibiya	20,052	7,991	124
Tokyo	Kojimachi	Underground	139.7373	35.6848	1	Yurakucho	32,660	5,553	96
Tokyo	Kokkai-gijidomae	Underground	139.7444	35.6740	4	Marunochi, Chiyoda, Namboku (Tameike-Sanno); Ginza (Tameike-Sanno)	76,030	667	31
Tokyo	Kokuritsu-kyogijo	Underground	139.7149	35.6799	1	Oedo	5,187	2,528	18
Tokyo	Komagome	Multiple	139.7472	35.7365	2	Namboku; JR - Yamanote	69,200	11,798	160
Tokyo	Korakuen	Underground	139.7518	35.7078	4	Marunouchi, Namboku, Mita (Kasuga), Oedo (Kasuga)	117,314	7,525	91
Tokyo	Koshu-kaido	Elevated	139.4092	35.6782	1	Tama Toshi Monorail	4,404	3,543	17
Tokyo	Kotake-mukaihara	Underground	139.6796	35.7434	3	Fukutoshin, Yurakucho; SEIBU - Seibu-Yurakucho	159,686	8,761	20
Tokyo	Kudanshita	Underground	139.7514	35.6955	3	Hanzomon, Tozai, Shinjuku	144,423	3,627	82
Tokyo	Kuramae (1) Asakusa	Underground	139.7923	35.7055	1	Asakusa	18,127	11,149	64
Tokyo	Kuramae (2) Oedo	Underground	139.7909	35.7031	1	Oedo	16,679	9,555	53
Tokyo	Kyobashi	Underground	139.7701	35.6767	1	Ginza	30,123	1,892	157
Tokyo	Machiya	Multiple	139.7801	35.7422	2	Chiyoda; JR - Keisei Mainline	41,268	12,456	83
Tokyo	Magome	Underground	139.7119	35.5965	1	Asakusa	14,176	11,034	51
Tokyo	Manganji	Elevated	139.4200	35.6712	1	Tama Toshi Monorail	4,034	4,395	18
Tokyo	Matsugaya	Elevated	139.4220	35.6318	1	Tama Toshi Monorail	1,208	3,696	6
Tokyo	Meguro	Multiple	139.7159	35.6326	4	Mita, Namboku; JR - Yamanote; TOKYU - Meguro	356,286	8,691	85
Tokyo	Meiji-jingumae	Underground	139.7053	35.6685	2	Chiyoda; Fukutoshin	54,200	3,255	294

City	Name (English)	Station Grade	Long	Lat	Lines	Line Names	ADB	POI	Population
Tokyo	Mejiro	At-Grade	139.7065	35.7211	1	JR - Yamanote	38,179	6,954	81
Tokyo	Minami-asagaya	Underground	139.6356	35.6994	1	Marunouchi	13,701	9,638	218
Tokyo	Minami-gyotoku	Underground	139.9022	35.6727	1	Tozai	27,088	9,923	34
Tokyo	Minami-senju	Multiple	139.7992	35.7334	3	Hibiya; JR - Joban; Tsukuba Express	36,905	9,078	49
Tokyo	Minami-sunamachi	Underground	139.8318	35.6684	1	Tozai	30,236	4,468	20
Tokyo	Minowa	Underground	139.7912	35.7293	1	Hibiya	20,455	13,154	46
Tokyo	Mita	Underground	139.7488	35.6479	2	Mita, Asakusa	108,113	7,307	364
Tokyo	Mitsukoshimae	Underground	139.7738	35.6855	2	Ginza, Hanzomon	65,742	869	98
Tokyo	Mizue	Underground	139.8979	35.6935	1	Shinjuku	28,314	8,664	82
Tokyo	Monzen-nakacho	Underground	139.7951	35.6723	2	Oedo, Shinkuku	103,160	9,208	112
Tokyo	Morishita	Underground	139.7982	35.6881	2	Shinjuku, Oedo	73,539	12,573	41
Tokyo	Motohasunuma	Underground	139.7021	35.7690	1	Mita	12,631	9,920	27
Tokyo	Motoyawata	Multiple	139.9266	35.7231	3	Shinjuku; JR - Chuo-Sobu; KEISEI - Keisei Mainline (Keisei Yawata)	99,075	9,206	93
Tokyo	Myoden	Elevated	139.9244	35.6911	1	Tozai	25,633	9,924	14
Tokyo	Myogadani	Underground	139.7369	35.7172	1	Marunouchi	39,515	9,405	62
Tokyo	Nagatacho	Underground	139.7403	35.6786	3	Yurakucho, Namboku, Hanzomon	41,526	1,509	56
Tokyo	Naka-meguro	Elevated	139.6991	35.6443	2	Hibiya; TOKYU - Toyoku	211,923	9,903	133
Tokyo	Naka-okachimachi	Underground	139.7762	35.7067	1	Hibiya	20,981	6,795	960
Tokyo	Nakai	Multiple	139.6868	35.7150	2	Oedo; SEIBU - Shinjuku	27,346	11,290	76
Tokyo	Nakano	Elevated	139.6658	35.7057	3	Tozai; JR - Chuo, Chuo-Sobu	230,047	8,521	241
Tokyo	Nakano-fujimicho	Underground	139.6682	35.6908	1	Marunouchi	9,814	9,986	62
Tokyo	Nakano-sakaue	Underground	139.6827	35.6972	2	Marunouchi; Oedo	58,577	11,665	75
Tokyo	Nakano-shimbashi	Underground	139.6741	35.6917	1	Marunouchi	10,285	13,333	48
Tokyo	Nakanobu	Multiple	139.7136	35.6054	2	Asakusa; TOKYU - Oimachi	26,967	13,251	38
Tokyo	Nerima	Multiple	139.6550	35.7378	4	Oedo; SEIBU - Seibu-Ikebukuro, Seibu-Toshima, Seibu-Yurakucho	104,933	11,240	106
Tokyo	Nerima-kasugacho	Underground	139.6408	35.7514	1	Oedo	11,161	7,611	37
Tokyo	Nezu	Underground	139.7658	35.7173	1	Chiyoda	14,389	10,683	134
Tokyo	Nihombashi	Underground	139.7746	35.6819	3	Asakusa, Ginza, Tozai	144,457	965	104
Tokyo	Ningyocho	Underground	139.7822	35.6864	2	Asakusa, Hibiya	67,718	10,577	117
Tokyo	Nippori	Multiple	139.7709	35.7280	5	JR - Yamanote, Joban, Keihin-Tohoku; KEISEI - Main Line; TOEI - Nippori Toneri Liner	189,465	8,930	90
Tokyo	Nishi-funabashi	Multiple	139.9593	35.7072	5	Tozai; JR - Chuo-Sobu, Masashino, Keiyo; TOYO - Toyo Rapid Railway Line	343,533	6,838	101
Tokyo	Nishi-kasai	Elevated	139.8592	35.6646	1	Tozai	52,066	15,687	68
Tokyo	Nishi-magome	Underground	139.7064	35.5874	1	Asakusa	24,027	8,246	39
Tokyo	Nishi-nippori	Multiple	139.7669	35.7324	4	Chiyoda; JR - Yamanote, Keihin-Tohoku; TOEI - Nippori Toneri Liner	198,545	8,454	68
Tokyo	Nishi-ojima	Underground	139.8263	35.6894	1	Shinjuku	14,287	12,647	23
Tokyo	Nishi-shinjuku	Underground	139.6926	35.6945	1	Marunouchi	42,433	7,743	133
Tokyo	Nishi-shinjuku-gochome	Underground	139.6846	35.6899	1	Oedo	17,039	12,410	55
Tokyo	Nishi-sugamo	Underground	139.7287	35.7435	1	Mita	15,198	11,616	15
Tokyo	Nishi-takashimadaira	Elevated	139.6457	35.7919	1	Mita	6,577	3,317	3
Tokyo	Nishi-waseda	Underground	139.7091	35.7078	1	Fukutoshin	19,419	6,799	56
Tokyo	Nishidai	Elevated	139.6728	35.7871	1	Mita	13,059	9,391	47
Tokyo	Nishigahara	Underground	139.7422	35.7460	1	Namboku	4,282	7,046	15
Tokyo	Nogizaka	Underground	139.7263	35.6667	1	Chiyoda	20,885	4,650	55
Tokyo	Ochanomizu	Multiple	139.7645	35.7004	4	Marunouchi; JR - Chuo, Chuo-Sobu; Chiyoda (Shin-Ochanomizu)	183,752	3,409	247
Tokyo	Ochiai	Underground	139.6859	35.7106	1	Tozai	13,312	12,656	116

City	Name (English)	Station Grade	Long	Lat	Lines	Line Names	ADB	POI	Population
Tokyo	Ochiai-minami-nagasaki	Underground	139.6835	35.7234	1	Oedo	13,705	10,163	54
Tokyo	Odaiba-kaihinkoen	Elevated	139.7785	35.6298	1	Yurikakome	8,378	2,329	30
Tokyo	Ogawamachi	Underground	139.7670	35.6953	3	Shinjuku, Chiyoda (Shin-Ochanomizu), Marunochi (Awajicho)	114,602	4,321	258
Tokyo	Ogikubo	Multiple	139.6199	35.7042	3	Marunouchi; JR - Chuo, Chuo-Sobu	133,757	10,686	388
Tokyo	Oi Keibajo-Mae	Elevated	139.7472	35.5951	1	Tokyo Monorail	5,425	2,001	4
Tokyo	Oimachi	Multiple	139.7349	35.6075	3	RINKAI - Rinkai; JR - Keihin-Tohoku; TOKYU - Oinachi	219,176	9,412	57
Tokyo	Oji	Multiple	139.7377	35.7531	2	Namboku; JR - Keihin-Tohoku	96,167	6,656	110
Tokyo	Oji-kamiya	Underground	139.7356	35.7653	1	Namboku	17,956	12,862	34
Tokyo	Ojima	Underground	139.8343	35.6898	1	Shinjuku	16,685	16,038	32
Tokyo	Okachimachi	Elevated	139.7748	35.7076	2	JR - Yamanote, Kehin-Tohoku	68,750	5,178	1475
Tokyo	Omotesando	Underground	139.7122	35.6652	3	Chiyoda, Ginza, Hanzomon	88,194	3,997	422
Tokyo	Onarimon	Underground	139.7515	35.6610	1	Mita	23,022	3,351	44
Tokyo	Osaki	At-Grade	139.7282	35.6197	4	JR - Yamanote, Shonan-Shinjuku, Saikyo; RINKAI	228,642	10,672	78
Tokyo	Oshiage	Underground	139.8134	35.7100	4	Asakusa, Hanzomon; TOBU - Skytree; KEISEI - Oshige	364,069	9,615	44
Tokyo	Otsuka	Multiple	139.7279	35.7318	1	JR - Yamanote	57,330	13,996	145
Tokyo	Otsuka teikyo-daigaku	Elevated	139.4165	35.6368	1	Tama Toshi Monorail	3,863	3,056	19
Tokyo	Roppongi	Underground	139.7321	35.6634	2	Hibiya, Oedo	116,890	4,484	175
Tokyo	Roppongi-itchome	Underground	139.7389	35.6652	1	Namboku	40,899	5,484	97
Tokyo	Ryogoku	Multiple	139.7975	35.6964	2	Oedo; JR - Chuo-Sobu	56,717	8,848	146
Tokyo	Sakura-kaido	Elevated	139.4166	35.7390	1	Tama Toshi Monorail	3,586	4,174	16
Tokyo	Sendagi	Underground	139.7633	35.7257	1	Chiyoda	14,773	12,492	129
Tokyo	Sengoku	Underground	139.7447	35.7280	1	Mita	16,159	10,265	51
Tokyo	Senkawa	Underground	139.6894	35.7382	2	Fukutoshin, Yurakucho	19,729	8,668	47
Tokyo	Shibakoen	Underground	139.7497	35.6534	1	Mita	15,551	5,932	56
Tokyo	Shibasaki-taiikukan	Elevated	139.4093	35.6898	1	Tama Toshi Monorail	2,200	3,399	16
Tokyo	Shibuya	Multiple	139.7016	35.6588	9	Fukutoshin, Hanzomon, Ginza; JR - Yamanote, Saikyo, Shonan-Shinjuku; TOKYU - Den-en-toshi, Toyoko; KEIO - Inokashira	1,466,810	3,027	584
Tokyo	Shijo-mae	Elevated	139.7856	35.6457	1	Yurikakome	1,244	1,134	4
Tokyo	Shimbashi	Multiple	139.7585	35.6663	7	Ginza, Asakua; Yurikakome; JR - Yamanote, Keihin-Tohoku, Yokosuka, Tokaido Main Line;	486,471	1,684	318
Tokyo	Shimo	Underground	139.7325	35.7780	1	Namboku	6,268	8,553	17
Tokyo	Shimura-sakaue	Underground	139.6946	35.7764	1	Mita	15,586	7,959	31
Tokyo	Shimura-sanchome	Elevated	139.6858	35.7774	1	Mita	16,398	9,150	44
Tokyo	Shin-egota	Underground	139.6706	35.7325	1	Oedo	14,120	9,058	25
Tokyo	Shin-itabashi	Underground	139.7194	35.7488	1	Mita	15,304	12,265	42
Tokyo	Shin-koenji	Underground	139.6485	35.6979	1	Marunouchi	18,701	10,491	167
Tokyo	Shin-nakano	Underground	139.6694	35.6975	1	Marunouchi	17,751	14,213	103
Tokyo	Shin-ochanomizu	Underground	139.7655	35.6970	5	Chiyoda, Shinjuku (Ogawamachi); Marunouchi (Ochanomizu); JR - Chuo, Chuo-Sobu (Ochanomizu)	219,718	3,396	337
Tokyo	Shin-okachimachi	Underground	139.7822	35.7070	2	Oedo; Tsukuba Express	46,894	12,587	211
Tokyo	Shin-okubo	Elevated	139.7003	35.7010	1	JR - Yamanote	48,220	11,532	150
Tokyo	Shin-otsuka	Underground	139.7294	35.7261	1	Marunouchi	12,753	12,234	25
Tokyo	Shin-takashimadaira	Elevated	139.6543	35.7902	1	Mita	5,070	6,256	11
Tokyo	Shin-toyosu	Elevated	139.7901	35.6487	1	Yurikakome	1,942	1,333	11
Tokyo	Shinagawa	Multiple	139.7390	35.6289	7	JR - Yamanote, Keihin-Tohoku, Tokaido ML, Yotsuka, Joban; SHINKANSEN - Tokaido; KEIKYU - Keikyu	555,815	3,180	89
Tokyo	Shinagawa Seaside	Elevated	139.7498	35.6098	1	Rinkai	23,332	5,780	30

City	Name (English)	Station Grade	Long	Lat	Lines	Line Names	ADB	POI	Population
Tokyo	Shinjuku	Multiple	139.7006	35.6893	11	Shinjuku, Oedo (Shinjuku-Nishiguchi), Marunouchi; JR - Yamanote, Chuo, Chuo-Sobu, Saikyo, Shonan-Shinjuku; KEIO - Keio Line, Keio New Line; ODAKYU - Odowara	1,762,773	2,202	405
Tokyo	Shinjuku-gyoemmae	Underground	139.7109	35.6885	1	Marunouchi	25,321	6,429	111
Tokyo	Shinjuku-nishiguchi	Underground	139.6991	35.6933	11	Oedo; SHINJUKU STATION - Shinjuku, Marunouchi; JR - Yamanote, Chuo, Chuo-Sobu, Saikyo, Shonan-Shinjuku; KEIO - Keio Line, Keio New Line; ODAKYU - Odowara	1,762,773	1,845	338
Tokyo	Shinjuku-sanchome	Underground	139.7051	35.6908	3	Marunouchi, Fukutoshin, Shinjuku	117,998	2,578	302
Tokyo	Shinozaki	Underground	139.9039	35.7061	1	Shinjuku	20,018	7,968	55
Tokyo	Shintomicho	Underground	139.7736	35.6705	1	Yurakucho	20,627	7,356	61
Tokyo	Shiodome	Multiple	139.7607	35.6642	2	Oedo, Yurkakome	31,340	1,993	132
Tokyo	Shirokane-takanawa	Underground	139.7344	35.6434	2	Mita, Namboku	34,966	13,461	62
Tokyo	Shirokanedai	Underground	139.7259	35.6378	2	Mita, Namboku	14,340	7,043	24
Tokyo	Showajima	Elevated	139.7499	35.5706	1	Tokyo Monorail	3,093	140	0
Tokyo	Suehirocho	Underground	139.7718	35.7028	1	Ginza	12,189	5,419	802
Tokyo	Sugamo	Multiple	139.7395	35.7334	2	Mita; JR - Yamanote	124,838	10,676	85
Tokyo	Suidobashi	Multiple	139.7552	35.7035	2	Mita; JR - Chuo-Sobu	107,254	5,747	125
Tokyo	Suitengumae	Underground	139.7852	35.6830	1	Hanzomon	39,364	11,166	115
Tokyo	Sumiyoshi	Underground	139.8156	35.6890	2	Shinjuku, Hanzomon	50,690	8,140	59
Tokyo	Sunagawa-nanaban	Elevated	139.4181	35.7234	1	Tama Toshi Monorail	2,383	3,312	18
Tokyo	Tabata	At-Grade	139.7615	35.7375	2	JR - Yamanote, Keihin-Tohoku	47,034	7,838	59
Tokyo	Tachihi	Elevated	139.4171	35.7143	1	Tama Toshi Monorail	5,782	577	21
Tokyo	Tachikawa-kita	Elevated	139.4127	35.6994	4	Tama Toshi Monorail; JR - Nambu, Chuo, Ome (all Tachikawa)	189,020	4,967	198
Tokyo	Tachikawa-minami	Elevated	139.4126	35.6962	4	Tama Toshi Monorail; JR - Nambu, Chuo, Ome (all Tachikawa)	182,992	5,140	194
Tokyo	Takadanobaba	Elevated	139.7046	35.7135	3	Tozai; JR - Yamanote; SEIBU - Seibu-Shinjuku	461,823	9,333	206
Tokyo	Takahatafudo	Multiple	139.4153	35.6614	3	Tama Toshi Monorail; KEIO - Main Line, Dobutsuen	43,806	4,466	97
Tokyo	Takamatsu	At-Grade	139.4133	35.7100	1	Tama Toshi Monorail	3,884	1,464	5
Tokyo	Takanawadai	Underground	139.7304	35.6317	1	Asakusa	7,233	7,535	35
Tokyo	Takaracho	Underground	139.7720	35.6755	1	Asakusa	14,919	3,751	158
Tokyo	Takashimadaira	Elevated	139.6612	35.7890	1	Mita	15,380	10,431	40
Tokyo	Takebashi	Underground	139.7576	35.6904	1	Tozai	24,118	403	61
Tokyo	Takeshiba	Elevated	139.7620	35.6541	1	Yurikakome	2,414	1,582	41
Tokyo	Tama-center	Elevated	139.4228	35.6240	3	Tama Toshi Monorail; ODAKYU - Tama (Odakyu Tama Center); KEIO - Sagamihara (Keio Tama Center)	86,584	3,656	93
Tokyo	Tama-dobutsukoen	Multiple	139.4038	35.6486	2	Tama Toshi Monorail; KEIO - Dobutsuen	4,564	1,720	8
Tokyo	Tamachi	At-Grade	139.7477	35.6458	2	JR - Yamanote, Keihin-Tohoku	154,915	5,759	366
Tokyo	Tamagawa-josui	Multiple	139.4179	35.7321	2	Tama Toshi Monorail; SEIBU - Seibu-Hajimi	30,137	4,379	20
Tokyo	Tameike-Sanno	Underground	139.7413	35.6721	4	Ginza, Namboku, Marunochi (Kokkaigijidomae), Chiyoda (Kokkaigijidomae)	76,030	3,354	162
Tokyo	Tawaramachi	Underground	139.7904	35.7099	1	Ginza	16,400	11,731	145
Tokyo	Tochomae	Underground	139.6928	35.6906	1	Oedo	24,239	1,636	113
Tokyo	Todai-mae	Underground	139.7579	35.7181	1	Namboku	14,570	7,825	48
Tokyo	Togoshi	Underground	139.7164	35.6144	1	Asakusa	11,050	14,412	40
Tokyo	Tokyo	Multiple	139.7666	35.6808	15	Marunouchi; JR - Yamanote, Yokosuka, Keiyo, Keihin-Tohoku, Ueno-Tokyo, Chuo, Chuo-Sobu Tokaido ML; SHINKANSEN - Tokaido, Tohoku, Joetsu, Yamagata, Akita, Hokuriku	772,597	62	116
Tokyo	Tokyo Teleport	Elevated	139.7781	35.6271	1	Rinkai	32,284	1,355	49
Tokyo	Toranomon	Underground	139.7501	35.6702	1	Ginza	59,033	772	354
Tokyo	Toshimaen	Multiple	139.6480	35.7420	2	Oedo; SEIBU (Seibu-Toshima)	12,920	7,937	16
Tokyo	Toyocho	Underground	139.8179	35.6696	1	Tozai	63,004	10,285	49
Tokyo	Toyosu	Multiple	139.7962	35.6543	2	Yurakucho; Yurikamome	118,266	12,274	76

City	Name (English)	Station Grade	Long	Lat	Lines	Line Names	ADB	POI	Population
Tokyo	Tsukiji	Underground	139.7725	35.6680	1	Hibiya	38,082	6,977	65
Tokyo	Tsukijishijo	Underground	139.7668	35.6649	1	Oedo	16,134	1,398	44
Tokyo	Tsukishima	Underground	139.7846	35.6643	2	Oedo, Yurakucho	74,454	16,169	60
Tokyo	Uchisaiwaicho	Underground	139.7551	35.6688	1	Mita	22,351	826	392
Tokyo	Ueno	Multiple	139.7767	35.7133	13	Ginza, Hibiya; SHINKANSEN - Tohoku, Yamagata, Akita, Joetsu, Hokkaido; JR - Utsunomiya, Takasaki, Joban, Ueno-Tokyo, Keihin-Tohoku, Yamanote	303,653	2,636	370
Tokyo	Ueno-hirokoji	Underground	139.7731	35.7080	2	Ginza, Oedo (Ueno-Okachimachi)	41,110	4,299	1551
Tokyo	Ueno-okachimachi	Underground	139.7732	35.7079	2	Oedo, Ginza (Ueno-Hirokoji)	41,110	4,332	1557
Tokyo	Uguisudani	At-Grade	139.7779	35.7215	2	JR - Yamanote, Keihin-Tohoku	25,375	6,323	133
Tokyo	Urayasu	Elevated	139.8934	35.6660	1	Tozai	40,820	9,531	76
Tokyo	Ushigome-kagurazaka	Underground	139.7361	35.7009	1	Oedo	7,192	11,629	252
Tokyo	Ushigome-yanagicho	Underground	139.7253	35.6994	1	Oedo	10,378	13,492	42
Tokyo	Wakamatsu-kawada	Underground	139.7183	35.6992	1	Oedo	15,798	10,177	68
Tokyo	Waseda	Underground	139.7219	35.7057	1	Tozai	41,299	9,381	103
Tokyo	Yotsuya	Multiple	139.7301	35.6859	3	Marunouchi, Namboku; JR - Chuo	161,849	3,179	55
Tokyo	Yotsuya-sanchome	Underground	139.7194	35.6878	1	Marunouchi	23,156	9,411	108
Tokyo	Yoyogi	Multiple	139.7020	35.6839	3	Oedo; JR - Yamanote, Chuo-Sobu	88,693	5,361	81
Tokyo	Yoyogi-koen	Underground	139.6898	35.6691	1	Chiyoda	14,052	7,337	57
Tokyo	Yoyogi-uehara	Elevated	139.6797	35.6689	2	Chiyoda; ODAKYU - Odakyu Odawara	270,395	7,826	68
Tokyo	Yurakucho	Multiple	139.7631	35.6755	3	Yurakucho; JR - Yamanote, Keihin-Tohoku	256,228	518	224
Tokyo	Yushima	Underground	139.7700	35.7070	1	Chiyoda	17,668	6,993	1027
Tokyo	Zoshigaya	Underground	139.7148	35.7203	1	Fukutoshin	9,293	10,062	30

ADB: Average Daily Boardings, POI: Point of Interest

Data Sources:

All Cities – POI OpenStreetMap (2019)

Bangkok – ADB: Bangkok Metropolitan Administration (2016)

Manila – ADB: Light Rail Transit Authority (2018), MRT (2017), Philippines National Railways (2017)

Osaka – ADB: Osaka Metro / Osaka Prefecture Statistical Yearbook (2017), JR West Busiest Stations (2017), Osaka Monorail (2017)

Taipei – ADB: Taipei Mass Rapid Transit (2018), Taipei Railways Administration (2018), Taipei High Speed Railway (2019)

Tokyo – ADB: Tokyo Metro (2017), Tokyo Metropolitan Government (2017), Tokyo City Statistics (2017)

Appendix C: Bangkok Dedicated Pedestrian Networks (400m).

Sukhumvit

Sala Daeng

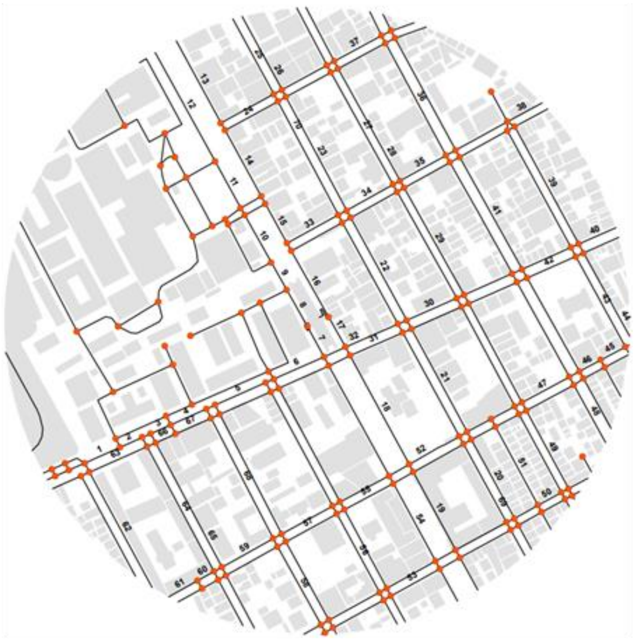
Chong Nonsi

*** Numbered segments correspond to survey locations in each respective study site.*

Appendix D: Manila Dedicated Pedestrian Networks (400m).

Carriedo

Pedro Gil

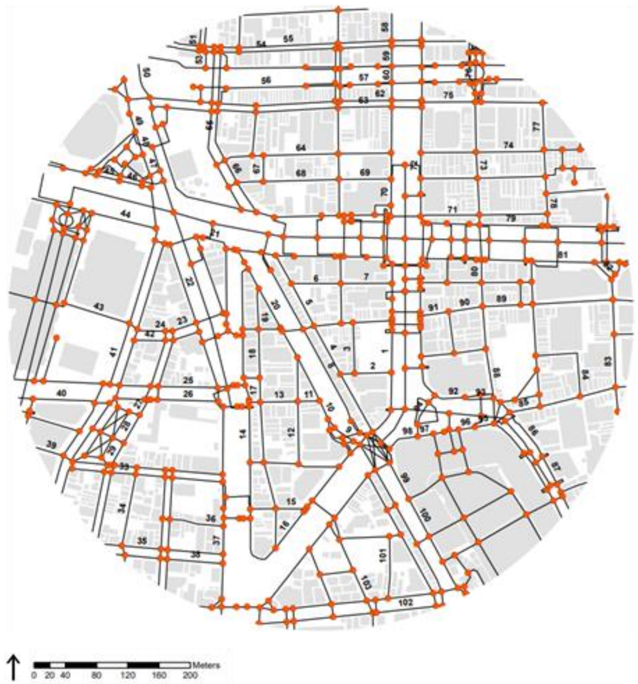


Roosevelt

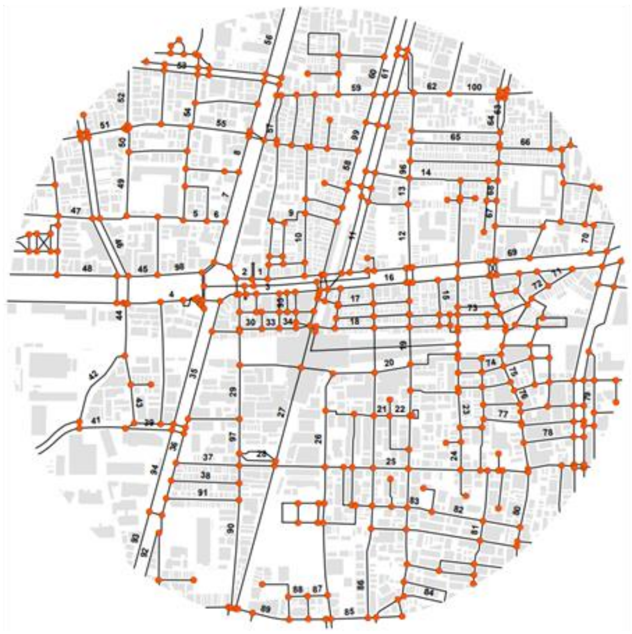
*** Numbered segments correspond to survey locations in each respective study site.*

Appendix E: Osaka Dedicated Pedestrian Networks (400m).

Namba



Tsuruhashi

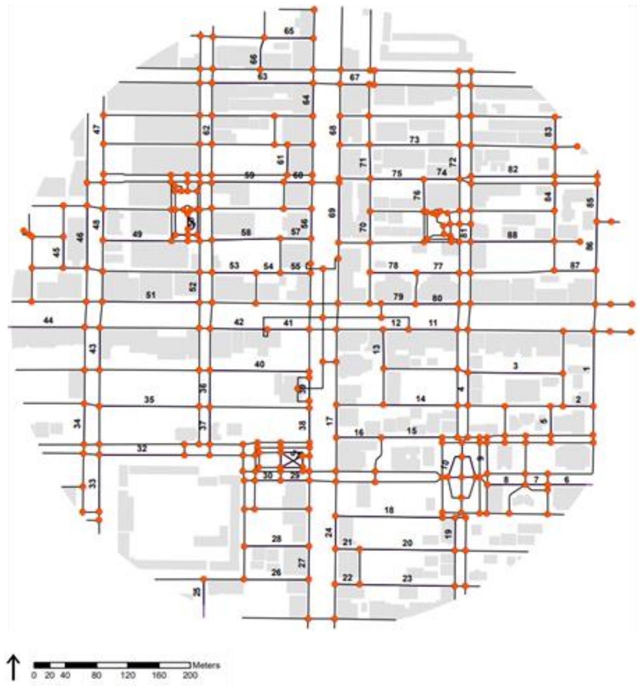


Tanimachi-Yonchome

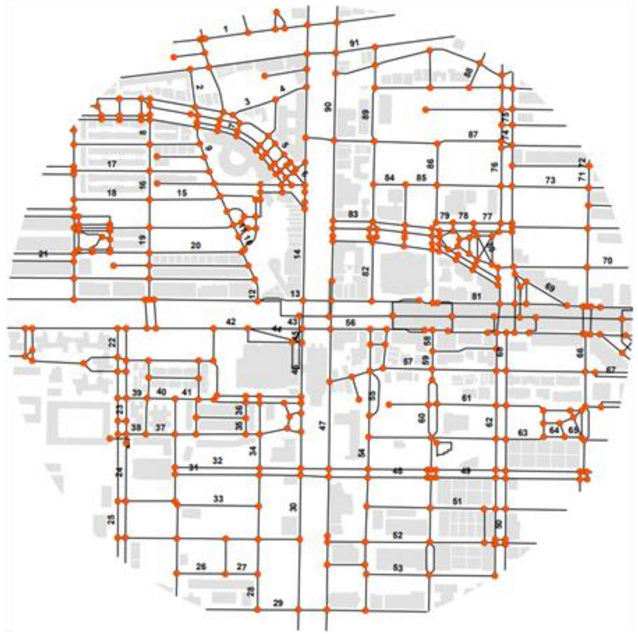
*** Numbered segments correspond to survey locations in each respective study site.*

Appendix F: Taipei Dedicated Pedestrian Networks (400m).

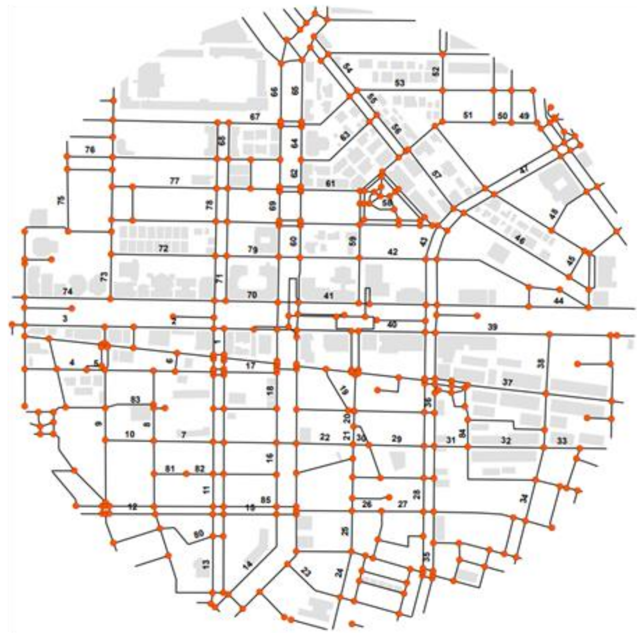
Songjiang-Nanjing



Zhongxiao-Fuxing



Xinyi-Anhe



*** Numbered segments correspond to survey locations in each respective study site.*

Appendix G: Tokyo Dedicated Pedestrian Networks (400m).

Ikebukuro

Nakano

Akasaka

*** Numbered segments correspond to survey locations in each respective study site.*

Appendix H: Walking Path Characteristics Survey Tool

Modal Conflict

Walking path modal conflict measures the extent of conflict between pedestrians and all other modes, including bicycles, motorcycles, and cars along walking paths. Modal conflict effectively measures pedestrian safety and traffic behaviour.

Score	Description	What to Look for
1	Significant conflict – conditions make walking impossible on intended path.	• Pedestrians forced in road. • Pedestrians forced to wait for cars in their path. • Constant weaving in and around cars.
2	Significant conflict – conditions make walking possible, but potentially dangerous and very inconvenient.	• Shared streets with heavy or high-speed traffic. • Narrow paths with many parked vehicles or scooters driving. • Pedestrians may have to briefly step into the road.
3	Some conflict – walking is possible, but not convenient.	• Evidence of scooter usage (parking >1 scooter) on sidewalks. • Shared walking paths with low-speed interaction.
4	Minimal conflict – pedestrians mix with non-motorized vehicles.	• Shared streets with painted lines. • Cars may cut path to enter parking or drives.
5	No conflict.	

Path Obstructions

Path obstructions considers the presence of permanent and temporary obstructions on pedestrian walking paths. These ultimately affect the effective width of the walking path and may cause inconvenience to pedestrians and restrict disabled access. Accordingly, paths with a low degree of obstructions contribute to pedestrian comfort, accessibility, and safety.

Score	Description	What to Look for
1	Significant conflict – walking path is completely blocked by permanent obstructions.	• Permanent obstructions such as utility poles, walls, and barriers that cause pedestrian to leave intended path and enter the roadway.
2	Significant conflict – walking path is blocked by temporary obstructions.	• Temporary obstructions such as signs, stalls, parked vehicles, and chairs that cause pedestrians to temporarily enter road way.
3	Some conflict – pedestrians mildly inconvenienced by obstructions	• Obstructions of any kind that cause pedestrians to significantly alter their movements. Effect width of path reduced to < 1m. • Pedestrians weaving between parked vehicles.
4	Minimal conflict – obstacles present minor inconvenience.	• Obstructions of any kind that cause pedestrians to slightly alter their movements. Effective width reduced but > 1m. • Obstructions are those aimed at pedestrians such as stalls, seating, and other pedestrian-oriented facilities.
5	No obstructions.	

Appendix I: Bangkok Datasets

Bangkok – Sukhumvit

ID	Path Type	Length (m)	Width (m)	Betweenness	Closeness	Straightness	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Mod. Con.	Path Obst.	PDR (am)	PDR (midday)	PDR (average)
SK_1	Sidewalk	206.7	2.49	0.0543	0.0039	0.7910	0.89	0.06	23.30	107.39	1	5.00	3.00	11.37	12.34	11.85
SK_2	Sidewalk	205.9	2.48	0.0138	0.0036	0.7912	0.70	0.00	157.60	107.00	1	4.00	4.00	25.74	21.86	23.80
SK_3	Sidewalk	173.1	2.10	0.0366	0.0038	0.8346	0.78	0.22	141.21	296.52	1	3.50	3.00	8.95	10.11	9.53
SK_4	Shared	59.1	2.00	0.0636	0.0036	0.8727	0.54	0.31	305.96	474.33	0	2.00	2.00	8.47	8.47	8.47
SK_5	Sidewalk	140.1	2.96	0.0450	0.0039	0.8339	0.78	0.00	294.04	325.35	1	4.00	3.50	5.00	10.35	7.68
SK_6	Shared	136.5	2.00	0.0555	0.0038	0.8301	0.00	1.00	290.54	314.61	0	2.00	1.00	0.37	0.73	0.55
SK_7	Sidewalk	21.2	2.99	0.0306	0.0039	0.7804	0.80	0.00	327.67	244.72	1	5.00	4.00	18.89	44.85	31.87
SK_8	Shared	21.4	2.00	0.0668	0.0038	0.7871	1.00	0.00	336.68	235.67	0	2.00	3.00	11.69	9.35	10.52
SK_9	Shared	56.5	2.00	0.0402	0.0038	0.7422	0.00	0.82	354.22	253.22	0	3.00	4.00	0.89	0.89	0.89
SK_10	Sidewalk	133.2	2.53	0.1176	0.0043	0.7969	0.88	0.00	272.17	121.74	1	3.50	4.00	13.89	15.76	14.83
SK_11	Sidewalk	133.0	3.61	0.0819	0.0043	0.7944	1.00	0.00	261.66	131.99	1	3.50	4.00	9.03	6.77	7.90
SK_12	Sidewalk	20.8	2.82	0.1211	0.0042	0.7784	0.75	0.00	311.71	207.96	1	5.00	5.00	7.21	12.01	9.61
SK_13	Shared	49.1	2.00	0.1228	0.0041	0.7521	0.88	0.00	276.75	242.92	0	3.00	4.00	5.09	10.18	7.64
SK_14	Shared	117.1	4.87	0.0969	0.0041	0.7748	0.78	0.22	162.47	215.30	0	3.00	4.00	8.97	19.65	14.31
SK_15	Sidewalk	63.9	4.86	0.0772	0.0038	0.8013	1.00	0.00	72.00	188.70	1	5.00	5.00	18.79	41.49	30.14
SK_16	Sidewalk	46.2	4.86	0.0529	0.0036	0.7833	0.80	0.00	59.83	243.71	1	5.00	5.00	18.41	32.49	25.45
SK_17	Sidewalk	154.6	2.95	0.0714	0.0039	0.7822	0.91	0.00	71.06	135.18	1	4.50	4.00	10.35	16.50	13.42
SK_18	Shared	202.2	3.89	0.0633	0.0036	0.7829	0.96	0.04	131.93	338.17	0	3.00	4.00	12.61	14.09	13.35
SK_19	Shared	106.9	2.00	0.0331	0.0034	0.6976	0.10	0.90	289.30	495.54	0	3.00	4.00	0.94	0.94	0.94
SK_20	Shared	133.1	2.00	0.1342	0.0044	0.8019	0.00	1.00	384.29	590.53	0	3.00	4.00	0.38	0.75	0.56
SK_21	Shared	92.1	2.00	0.2955	0.0052	0.7333	0.00	1.00	512.17	718.42	0	3.00	4.00	1.09	2.17	1.63
SK_22	Shared	53.8	2.00	0.0322	0.0038	0.6512	0.91	0.09	177.37	186.25	0	3.00	3.00	1.86	23.25	12.56
SK_23	Shared	250.8	2.00	0.0454	0.0038	0.7502	0.16	0.79	210.60	341.29	0	3.00	3.50	2.39	5.78	4.09
SK_24	Sidewalk	100.0	3.54	0.0634	0.0037	0.8017	0.71	0.00	21.48	303.19	1	4.00	4.00	1.00	8.00	4.50
SK_25	Shared	58.4	2.00	0.0391	0.0035	0.6844	0.63	0.00	143.89	231.20	0	3.00	4.00	7.71	8.57	8.14
SK_26	Sidewalk	51.0	3.23	0.0846	0.0038	0.7311	0.50	0.00	89.22	176.53	1	4.50	4.00	2.94	6.87	4.90
SK_27	Sidewalk	94.5	3.64	0.1328	0.0043	0.7568	0.86	0.00	16.46	103.78	1	3.00	4.00	7.93	4.76	6.35
SK_28	Sidewalk	99.9	3.42	0.1392	0.0044	0.7681	0.83	0.00	80.75	106.45	1	4.00	4.00	16.52	9.01	12.77
SK_29	Walkway	53.0	3.01	0.0934	0.0042	0.7624	1.00	0.00	195.08	64.13	1	5.00	5.00	14.16	14.16	14.16
SK_30	Walkway	49.3	3.05	0.0733	0.0040	0.7201	1.00	0.00	218.41	115.23	1	5.00	5.00	11.17	20.30	15.74
SK_31	Walkway	24.3	6.25	0.0487	0.0044	0.7825	1.00	0.00	120.72	33.41	1	5.00	5.00	43.26	115.37	79.32
SK_32	Walkway	94.1	6.25	0.0532	0.0044	0.7977	1.00	0.00	179.90	60.62	1	5.00	5.00	10.63	36.14	23.38
SK_33	Sidewalk	57.7	3.10	0.1181	0.0043	0.7993	1.00	0.00	178.64	61.89	1	4.00	3.50	13.87	17.33	15.60
SK_34	Sidewalk	40.5	3.10	0.1335	0.0045	0.8013	1.00	0.00	144.06	33.31	1	5.00	4.50	58.04	50.63	54.33
SK_35	Walkway	134.1	4.01	0.0393	0.0045	0.7566	1.00	0.00	154.35	67.04	1	5.00	5.00	77.20	42.89	60.04
SK_36	Walkway	30.9	4.10	0.0274	0.0045	0.7714	1.00	0.00	162.11	124.53	1	5.00	5.00	76.15	53.47	64.81
SK_37	Sidewalk	147.6	3.21	0.0831	0.0041	0.8095	0.50	0.07	132.47	170.20	1	4.00	4.00	40.30	15.24	27.77
SK_38	Sidewalk	84.9	2.42	0.0186	0.0038	0.8365	0.80	0.20	168.99	354.36	1	5.00	4.00	35.91	27.08	31.49
SK_39	Sidewalk	136.3	4.44	0.1039	0.0043	0.8276	0.77	0.00	124.11	192.62	1	3.00	4.00	10.64	15.77	13.21
SK_40	Sidewalk	108.3	2.12	0.0446	0.0038	0.8026	0.73	0.09	110.10	314.92	1	4.00	3.00	6.46	5.54	6.00
SK_41	Sidewalk	101.7	3.79	0.0788	0.0038	0.8076	0.75	0.00	95.78	322.62	1	3.00	4.00	5.90	8.36	7.13

ID	Path Type	Length (m)	Width (m)	Betweenness	Closeness	Straightness	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Mod. Con.	Path Obst.	PDR (am)	PDR (midday)	PDR (average)
SK_42	Sidewalk	27.8	5.78	0.1009	0.0040	0.8549	1.00	0.00	31.07	285.66	1	3.00	3.00	3.60	3.60	3.60
SK_43	Sidewalk	75.5	5.10	0.0898	0.0038	0.8427	0.83	0.00	28.05	344.79	1	5.00	5.00	9.27	15.22	12.25
SK_44	Sidewalk	104.4	3.44	0.0595	0.0043	0.8330	1.00	0.00	83.58	136.44	1	3.00	4.00	30.18	16.29	23.24
SK_45	Sidewalk	30.6	3.44	0.1084	0.0046	0.8358	0.59	0.00	140.94	68.97	1	4.50	5.00	9.81	21.26	15.54
SK_46	Sidewalk	32.1	3.30	0.0905	0.0045	0.8023	0.59	0.00	101.54	23.97	1	5.00	5.00	32.67	31.11	31.89
SK_47	Sidewalk	42.9	3.30	0.0427	0.0042	0.7612	1.00	0.00	64.00	29.37	1	5.00	4.00	25.62	4.66	15.14
SK_48	Sidewalk	349.1	3.30	0.0177	0.0041	0.7987	0.56	0.19	115.26	222.80	1	3.00	3.00	6.73	6.16	6.44
SK_49	Sidewalk	30.0	3.33	0.1183	0.0040	0.8547	1.00	0.00	68.33	265.44	1	4.00	4.00	31.71	5.01	18.36
SK_50	Sidewalk	37.2	3.33	0.1419	0.0043	0.8670	0.50	0.00	62.08	366.78	1	4.00	3.50	12.09	16.12	14.11
SK_51	Shared (Defacto)	57.3	2.00	0.0794	0.0042	0.8545	0.67	0.00	108.26	305.36	0	3.00	3.00	2.62	5.24	3.93
SK_52	Sidewalk	37.9	2.23	0.1166	0.0045	0.8627	0.67	0.00	106.25	303.43	1	5.00	3.50	18.47	3.96	11.21
SK_53	Sidewalk	34.8	1.88	0.0849	0.0044	0.8807	0.50	0.00	221.39	418.49	1	2.00	2.00	1.44	1.44	1.44
SK_54	Sidewalk	64.8	1.88	0.1147	0.0045	0.8962	0.50	0.00	275.80	472.90	1	2.00	2.00	2.31	2.31	2.31
SK_55	Sidewalk	199.5	2.01	0.0606	0.0039	0.8425	0.57	0.14	298.94	444.28	1	3.50	3.00	5.51	2.26	3.89
SK_56	Sidewalk	199.4	2.01	0.0717	0.0040	0.8453	0.89	0.00	307.48	452.82	1	5.00	3.00	3.51	12.54	8.02
SK_57	Sidewalk	109.5	2.24	0.0607	0.0039	0.8044	0.75	0.25	394.38	407.88	1	3.00	2.00	1.83	4.11	2.97
SK_58	Sidewalk	185.9	2.51	0.1115	0.0043	0.8543	0.17	0.50	421.38	564.92	1	3.00	2.00	2.42	1.34	1.88
SK_59	Sidewalk	114.9	1.89	0.1239	0.0040	0.8202	0.80	0.20	514.97	528.48	1	4.00	2.00	0.87	0.87	0.87
SK_60	Shared	21.6	2.00	0.1052	0.0040	0.8017	0.50	0.50	456.00	469.51	0	3.00	4.00	2.32	2.32	2.32
SK_61	Shared	52.4	2.00	0.0354	0.0038	0.7982	0.00	1.00	493.01	506.52	0	3.00	3.00	1.91	1.91	1.91
SK_62	Sidewalk	114.2	1.59	0.0919	0.0039	0.8110	0.50	0.33	388.11	401.62	1	2.00	1.50	1.75	1.31	1.53
SK_63	Sidewalk	155.2	2.09	0.0297	0.0036	0.7924	0.93	0.07	253.42	266.92	1	4.50	3.00	10.63	3.54	7.09
SK_64	Sidewalk	155.3	2.05	0.0229	0.0036	0.7847	0.67	0.22	249.96	258.25	1	4.00	3.00	5.80	5.15	5.47
SK_65	Pedestrian	129.8	4.59	0.0339	0.0039	0.7558	1.00	0.00	107.43	115.72	1	4.50	4.00	10.02	22.73	16.37
SK_66	Sidewalk	149.8	2.02	0.0463	0.0038	0.8033	0.61	0.00	106.29	255.51	1	4.00	3.00	11.01	17.02	14.02
SK_67	Sidewalk	154.4	2.56	0.0332	0.0038	0.8068	0.67	0.19	98.64	266.50	1	4.00	4.00	7.77	15.22	11.50
SK_68	Sidewalk	65.7	3.44	0.0652	0.0039	0.8511	0.58	0.00	11.40	231.42	1	5.00	4.50	22.06	34.24	28.15
SK_69	Shared	232.9	2.00	0.0240	0.0034	0.7537	0.38	0.25	186.02	406.04	0	3.00	3.00	2.79	1.29	2.04
SK_70	Sidewalk	207.3	2.28	0.0610	0.0037	0.7861	0.15	0.69	171.07	538.61	0	3.00	2.00	2.41	1.69	2.05
SK_71	Shared	47.9	2.00	0.0918	0.0038	0.7833	0.40	0.40	384.86	752.39	0	2.50	2.50	4.18	1.04	2.61
SK_72	Shared	121.4	2.00	0.0444	0.0038	0.8257	0.00	1.00	374.09	741.63	0	3.00	4.00	0.82	0.82	0.82
SK_73	Sidewalk	26.6	2.48	0.0474	0.0041	0.8579	1.00	0.00	70.03	280.33	1	5.00	5.00	11.26	15.02	13.14
SK_74	Sidewalk	77.5	2.23	0.1163	0.0044	0.8664	0.91	0.00	160.47	361.11	1	4.00	3.50	7.10	3.87	5.49

Bangkok – Sala Daeng

ID	Path Type	Length (m)	Width (m)	Betweenness	Closeness	Straightness	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Mod. Con.	Path Obst.	PDR (am)	PDR (midday)	PDR (average)
SD_1	Sidewalk	43.64	2.61	0.0559	0.0040	0.8696	0.50	0.00	59.81	373.02	0.50	5.00	4.00	8.02	10.31	9.17
SD_2	Sidewalk	20.55	2.25	0.0877	0.0041	0.8352	1.00	0.00	184.55	371.26	1.00	4.50	5.00	14.60	12.16	13.38
SD_3	Sidewalk	70.45	2.47	0.0798	0.0041	0.8239	0.60	0.00	230.05	325.76	0.60	4.00	4.50	8.52	3.55	6.03
SD_4	Sidewalk	188.79	4.90	0.0372	0.0037	0.8305	0.13	0.00	153.85	370.06	0.13	3.00	3.00	2.38	2.65	2.52
SD_5	Sidewalk	20.70	2.47	0.0703	0.0041	0.8230	0.60	0.00	236.19	280.18	0.60	3.00	4.00	9.66	4.83	7.24
SD_6	Sidewalk	118.22	4.14	0.0713	0.0038	0.8128	0.00	0.00	89.51	441.57	0.00	3.50	3.00	2.96	5.50	4.23
SD_7	Sidewalk	162.40	3.81	0.0304	0.0037	0.7939	0.00	0.00	215.34	476.73	0.00	4.00	3.00	1.23	3.39	2.31
SD_8	Sidewalk	54.37	4.13	0.0467	0.0038	0.7606	0.00	0.00	3.47	327.49	0.00	5.00	4.00	57.93	23.91	40.92
SD_9	Sidewalk	57.86	4.13	0.0509	0.0037	0.7396	0.00	0.00	59.59	271.38	0.00	4.50	4.50	11.23	9.51	10.37
SD_10	Sidewalk	72.38	3.78	0.0584	0.0038	0.7725	0.50	0.00	202.93	176.41	0.50	5.00	4.00	15.20	5.53	10.36
SD_11	Pedestrian Bridge	55.45	2.90	0.0790	0.0040	0.7918	1.00	0.00	187.57	131.60	1.00	5.00	5.00	50.49	45.98	48.24
SD_12	Sidewalk	82.63	3.21	0.0506	0.0037	0.7044	1.00	0.00	68.11	201.67	1.00	5.00	3.00	33.89	16.94	25.41
SD_13	Sidewalk	34.30	4.16	0.0805	0.0038	0.7705	0.00	0.00	126.58	143.20	0.00	5.00	3.00	10.20	14.58	12.39
SD_14	Sidewalk	66.56	5.43	0.1008	0.0040	0.7784	0.67	0.00	154.95	122.55	0.67	4.50	4.00	13.52	22.54	18.03
SD_15	Shared	22.60	2.00	0.0630	0.0039	0.7289	0.00	0.00	120.87	72.74	0.00	2.50	3.00	2.21	0.00	1.11
SD_16	Sidewalk	37.40	4.58	0.0982	0.0040	0.7783	1.00	0.00	114.54	66.41	1.00	4.00	5.00	60.16	41.44	50.80
SD_17	Sidewalk	26.01	4.58	0.0975	0.0040	0.7842	1.00	0.00	108.84	60.72	1.00	5.00	5.00	71.14	21.15	46.14
SD_18	Pedestrian Alley	28.61	4.51	0.0567	0.0040	0.7174	1.00	0.00	212.16	186.27	1.00	5.00	5.00	101.37	68.16	84.77
SD_19	Shared	57.83	2.00	0.1172	0.0042	0.7894	0.40	0.00	234.94	255.91	0.40	3.00	4.00	6.92	6.05	6.48
SD_20	Sidewalk	46.25	5.20	0.1016	0.0040	0.7930	0.67	0.00	143.39	361.71	0.67	3.00	4.00	9.73	11.89	10.81
SD_21	Sidewalk	18.84	2.67	0.0880	0.0041	0.8352	0.00	0.00	215.44	277.57	0.00	5.00	4.00	2.65	2.65	2.65
SD_22	Shared (Defacto)	60.92	2.00	0.0587	0.0041	0.7849	1.00	0.00	255.15	237.69	1.00	3.00	4.00	6.57	10.67	8.62
SD_23	Shared (Defacto)	62.18	2.00	0.0467	0.0042	0.7835	0.83	0.00	253.65	227.76	0.83	3.00	3.50	8.85	5.63	7.24
SD_24	Shared (Defacto)	54.99	2.00	0.0553	0.0041	0.7241	1.00	0.00	205.63	179.74	1.00	3.00	4.00	18.19	19.10	18.64
SD_25	Shared (Defacto)	55.04	2.00	0.0248	0.0041	0.7233	1.00	0.00	195.04	169.14	1.00	3.00	4.00	9.08	18.17	13.63
SD_26	Pedestrian	19.97	4.50	0.0502	0.0039	0.7149	1.00	0.00	188.12	162.23	1.00	5.00	5.00	162.70	135.17	148.94
SD_27	Sidewalk	53.39	2.06	0.0858	0.0040	0.7670	1.00	0.00	90.29	64.39	1.00	5.00	4.00	16.86	22.48	19.67
SD_28	Sidewalk	18.17	5.46	0.1025	0.0040	0.8122	1.00	0.00	54.51	28.62	1.00	5.00	5.00	46.79	52.29	49.54
SD_29	Sidewalk	91.86	5.46	0.0864	0.0040	0.8083	1.00	0.00	0.50	65.46	1.00	5.00	4.00	77.29	63.69	70.49
SD_30	Shared	119.10	2.00	0.0262	0.0037	0.8047	1.00	0.00	105.98	170.94	1.00	4.00	4.50	26.87	49.54	38.20
SD_31	Sidewalk	49.74	4.23	0.0538	0.0038	0.8346	1.00	0.00	115.96	180.92	1.00	5.00	4.00	100.52	17.09	58.80
SD_32	Pedestrian	64.30	12.11	0.0341	0.0036	0.8144	1.00	0.00	143.62	237.94	1.00	4.00	4.50	201.39	48.21	124.80
SD_33	Shared (Defacto)	40.44	2.00	0.0345	0.0036	0.7507	0.67	0.00	178.72	243.68	0.67	3.00	4.00	2.47	8.66	5.56
SD_34	Shared (Defacto)	59.18	2.00	0.0454	0.0036	0.7340	0.78	0.00	188.09	253.05	0.78	4.00	4.00	2.53	9.29	5.91
SD_35	Shared (Defacto)	52.09	2.00	0.0477	0.0039	0.8159	0.25	0.00	131.31	399.06	0.25	5.00	4.00	1.92	1.92	1.92
SD_36	Shared (Defacto)	53.14	2.00	0.0647	0.0039	0.8179	0.80	0.00	119.97	405.85	0.80	5.00	4.00	4.70	10.35	7.53
SD_37	Sidewalk	55.03	1.92	0.0338	0.0037	0.7488	0.80	0.00	174.06	351.77	0.80	5.00	4.00	5.45	12.72	9.09
SD_38	Sidewalk	37.06	2.69	0.0782	0.0040	0.8658	1.00	0.00	123.79	405.06	1.00	5.00	4.00	5.40	24.28	14.84
SD_39	Sidewalk	34.70	4.01	0.0352	0.0036	0.8251	1.00	0.00	94.11	223.14	1.00	5.00	4.00	66.28	36.02	51.15
SD_40	Sidewalk	115.55	4.01	0.0333	0.0034	0.8092	0.75	0.00	18.99	298.27	0.75	4.00	4.00	32.89	34.62	33.75
SD_41	Sidewalk	117.28	4.74	0.0400	0.0037	0.8272	1.00	0.00	124.87	182.89	1.00	5.00	5.00	71.20	100.19	85.70
SD_42	Sidewalk	92.40	3.50	0.0555	0.0038	0.8105	0.94	0.00	99.27	157.29	0.94	5.00	4.00	75.76	73.60	74.68
SD_43	Sidewalk	37.19	2.00	0.0486	0.0037	0.7703	0.50	0.00	163.85	221.87	0.50	3.00	4.00	9.41	13.44	11.43
SD_44	Sidewalk	24.91	2.60	0.0393	0.0037	0.7902	0.75	0.00	157.71	215.73	0.75	5.00	5.00	12.04	20.07	16.05

ID	Path Type	Length (m)	Width (m)	Betweenness	Closeness	Straightness	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Mod. Con.	Path Obst.	PDR (am)	PDR (midday)	PDR (average)
SD_45	Sidewalk	101.40	3.25	0.0829	0.0039	0.8153	0.88	0.00	228.30	286.32	0.88	5.00	3.50	27.61	97.63	62.62
SD_46	Sidewalk	26.65	3.25	0.1516	0.0042	0.8521	1.00	0.00	312.75	370.77	1.00	5.00	4.00	20.64	88.19	54.42
SD_47	Shared (Defacto)	102.20	2.50	0.1950	0.0043	0.8285	0.83	0.00	377.17	435.19	0.83	4.00	4.00	8.81	14.19	11.50
SD_48	Shared	142.23	2.00	0.0981	0.0040	0.6954	0.00	1.00	499.38	557.41	0.00	2.00	3.50	1.41	1.41	1.41
SD_49	Shared	56.13	2.00	0.0391	0.0039	0.6414	0.00	0.83	582.94	640.97	0.00	3.00	2.00	1.78	0.00	0.89
SD_50	Sidewalk	33.29	2.62	0.0700	0.0039	0.8123	0.00	0.00	300.46	434.96	0.00	5.00	4.00	6.01	15.02	10.51
SD_51	Sidewalk	45.77	2.61	0.0677	0.0041	0.8447	0.00	0.00	337.40	395.43	0.00	5.00	3.00	1.09	14.20	7.65
SD_52	Sidewalk	26.69	2.59	0.0463	0.0041	0.8453	0.00	0.00	301.17	359.19	0.00	4.00	4.00	1.88	7.49	4.68
SD_53	Sidewalk	100.89	2.81	0.0641	0.0038	0.7988	0.86	0.00	215.99	274.01	0.86	5.00	3.00	3.96	17.35	10.65
SD_54	Shared	57.18	2.00	0.0060	0.0038	0.7175	0.38	0.00	73.43	81.91	0.38	3.00	4.00	4.37	7.87	6.12
SD_55	Sidewalk	20.17	3.74	0.0397	0.0039	0.7934	1.00	0.00	54.92	43.23	1.00	5.00	5.00	54.54	119.00	86.77
SD_56	Sidewalk	67.30	3.71	0.0577	0.0040	0.7944	1.00	0.00	19.34	66.80	1.00	5.00	5.00	28.23	56.47	42.35
SD_57	Walkway	172.14	3.12	0.0420	0.0040	0.7916	1.00	0.00	134.19	86.07	1.00	5.00	5.00	63.90	38.34	51.12
SD_58	Sidewalk	56.40	2.15	0.0918	0.0040	0.7911	1.00	0.00	51.51	107.48	1.00	5.00	5.00	50.53	46.10	48.32
SD_59	Sidewalk	47.93	2.15	0.0780	0.0038	0.7836	0.86	0.00	103.60	159.57	0.86	4.50	4.50	22.95	28.16	25.56
SD_60	Sidewalk	47.85	1.86	0.0730	0.0038	0.8033	1.00	0.00	95.42	151.39	1.00	5.00	3.00	36.58	27.17	31.87
SD_61	Sidewalk	45.29	1.86	0.0779	0.0039	0.7935	0.71	0.00	149.08	205.04	0.71	5.00	4.00	7.73	18.77	13.25
SD_62	Sidewalk	52.07	1.91	0.0969	0.0041	0.8005	0.86	0.00	197.75	253.72	0.86	5.00	5.00	22.09	32.65	27.37
SD_63	Sidewalk	64.99	1.88	0.1190	0.0044	0.8496	0.80	0.00	256.28	312.25	0.80	5.00	5.00	10.00	25.39	17.69
SD_64	Shared	47.84	2.00	0.0251	0.0042	0.7278	0.00	1.00	265.54	321.51	0.00	3.00	4.00	1.05	0.00	0.52
SD_65	Shared	93.51	2.00	0.1457	0.0044	0.8021	0.83	0.08	335.53	391.50	0.83	3.00	4.00	9.62	19.78	14.70
SD_66	Sidewalk	64.94	1.62	0.1171	0.0043	0.8573	0.75	0.00	261.85	317.82	0.75	4.00	5.00	5.39	23.10	14.24
SD_67	Sidewalk	44.37	1.66	0.1522	0.0045	0.8806	0.67	0.00	316.51	372.48	0.67	4.00	4.00	3.38	11.27	7.32
SD_68	Sidewalk	48.73	1.70	0.0365	0.0039	0.7774	0.50	0.00	159.06	215.03	0.50	5.00	4.00	3.08	9.24	6.16
SD_69	Sidewalk	48.66	1.73	0.0701	0.0040	0.8071	0.50	0.00	205.05	261.01	0.50	4.00	3.50	6.16	8.22	7.19
SD_70	Shared (Defacto)	44.70	2.00	0.0352	0.0036	0.7037	1.00	0.00	201.48	257.45	1.00	3.00	4.00	14.54	12.30	13.42
SD_71	Shared (Defacto)	51.56	2.00	0.0470	0.0037	0.7647	1.00	0.00	153.35	209.32	1.00	4.00	4.00	17.45	18.42	17.94
SD_72	Sidewalk	51.94	1.70	0.0234	0.0037	0.7403	0.50	0.00	160.67	216.64	0.50	5.00	5.00	2.89	5.78	4.33
SD_73	Shared	300.13	2.00	0.0905	0.0040	0.7879	0.50	0.32	381.01	436.97	0.50	3.00	4.00	4.16	13.99	9.08
SD_74	Sidewalk	191.95	1.79	0.0401	0.0036	0.7465	0.79	0.00	261.52	319.54	0.79	5.00	5.00	8.60	22.14	15.37
SD_75	Shared (Defacto)	191.85	2.00	0.0493	0.0036	0.7394	0.75	0.13	253.77	311.80	0.75	4.00	2.00	3.13	16.42	9.77
SD_76	Sidewalk	71.06	3.13	0.0551	0.0040	0.8067	1.00	0.00	20.44	35.53	1.00	5.00	4.00	45.03	48.55	46.79
SD_77	Sidewalk	39.17	3.00	0.0713	0.0040	0.7721	0.50	0.00	75.55	19.58	0.50	5.00	4.00	16.60	2.55	9.57
SD_78	Sidewalk	367.88	2.90	0.0398	0.0039	0.7806	0.33	0.00	289.12	233.15	0.33	5.00	3.00	3.53	3.13	3.33
SD_79	Public Space	34.64	20.21	0.0564	0.0040	0.8172	0.00	0.00	219.04	39.39	0.00	5.00	5.00	8.66	56.29	32.47
SD_80	Public Space	42.30	19.81	0.0436	0.0040	0.7919	0.00	0.00	180.57	43.22	0.00	5.00	5.00	7.09	55.55	31.32
SD_81	Public Space	68.76	9.28	0.0712	0.0040	0.8143	0.00	0.00	177.36	91.09	0.00	5.00	5.00	1.45	1.45	1.45
SD_82	Sidewalk	53.72	2.55	0.0446	0.0038	0.7774	0.00	0.00	95.77	171.45	0.00	5.00	4.50	3.72	1.86	2.79
SD_83	Sidewalk	18.54	2.47	0.0769	0.0041	0.8276	0.67	0.00	204.62	288.23	0.67	5.00	4.00	2.70	2.70	2.70
SD_84	Sidewalk	31.64	2.47	0.0811	0.0041	0.8281	0.00	0.00	179.53	311.32	0.00	5.00	4.50	1.58	1.58	1.58
SD_85	Pedestrian Bridge	16.91	2.90	0.0616	0.0040	0.7738	1.00	0.00	151.39	95.42	1.00	5.00	5.00	53.23	23.66	38.45
SD_86	Shared	25.29	2.00	0.0133	0.0038	0.6705	0.00	0.33	144.81	96.69	0.00	2.00	2.00	3.95	0.00	1.98
SD_87	Shared	20.88	2.00	0.0133	0.0038	0.6723	0.00	0.50	142.60	94.48	0.00	2.00	2.00	0.12	0.00	0.06

Bangkok – Chong Nonsi

ID	Path Type	Length (m)	Width (m)	Betweenness	Closeness	Straightness	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Mod. Con.	Path Obst.	PDR (am)	PDR (midday)	PDR (average)
CN_1	Sidewalk	96.51	3.15	0.0321	0.0036	0.7707	0.57	0.14	82.08	385.75	1	5.00	5.00	6.22	12.95	9.58
CN_2	Pedestrian	54.76	2.00	0.0171	0.0035	0.7418	0.71	0.00	44.29	358.30	1	5.00	4.00	1.83	1.83	1.83
CN_3	Sidewalk	134.25	3.00	0.0312	0.0035	0.8005	0.00	0.00	129.34	477.17	1	5.00	4.00	7.08	6.33	6.70
CN_4	Sidewalk	115.43	3.03	0.0386	0.0034	0.7367	0.60	0.00	112.72	460.54	1	3.00	3.00	9.53	8.23	8.88
CN_5	Sidewalk	161.76	1.05	0.0507	0.0036	0.7253	0.00	0.20	251.32	377.03	1	2.00	1.00	1.85	2.78	2.32
CN_6	Sidewalk	52.42	2.50	0.0429	0.0038	0.7544	1.00	0.00	272.16	332.45	1	5.00	4.00	21.94	83.94	52.94
CN_7	Sidewalk	52.61	2.63	0.0847	0.0038	0.7613	0.60	0.20	262.17	322.45	1	4.50	3.00	5.70	11.40	8.55
CN_8	Shared	72.51	2.00	0.0468	0.0042	0.7029	0.00	0.56	378.24	504.06	0	3.00	3.00	0.69	0.69	0.35
CN_9	Sidewalk	59.49	2.23	0.0936	0.0045	0.8011	0.25	0.50	304.72	490.04	1	4.00	3.00	4.20	5.04	4.62
CN_10	Shared	67.57	2.00	0.0684	0.0042	0.6934	0.00	0.33	209.98	636.26	0	3.00	3.00	1.48	0.00	0.74
CN_11	Sidewalk	166.26	2.03	0.0847	0.0038	0.8231	0.00	0.00	69.37	490.60	1	4.00	3.50	3.31	3.01	3.16
CN_12	Sidewalk	101.69	2.33	0.0895	0.0037	0.7910	0.25	0.25	178.79	458.32	1	4.00	4.00	8.36	6.39	7.38
CN_13	Shared	37.34	2.00	0.0477	0.0037	0.7049	0.11	0.11	248.30	516.10	0	3.00	3.50	1.34	2.68	1.34
CN_14	Sidewalk	82.15	2.31	0.0901	0.0039	0.7421	0.63	0.13	270.71	456.35	1	3.50	3.50	5.48	29.21	17.35
CN_15	Sidewalk	82.13	2.12	0.0278	0.0039	0.7436	0.56	0.00	280.96	446.39	1	3.50	2.50	5.48	3.04	4.26
CN_16	Sidewalk	43.07	1.94	0.0890	0.0039	0.7552	0.50	0.25	310.00	370.29	1	5.00	4.00	2.32	5.80	4.06
CN_17	Shared	112.32	3.72	0.0683	0.0037	0.7237	0.50	0.50	179.70	239.99	0	3.00	5.00	12.02	20.48	16.25
CN_18	Pedestrian Alley	100.93	3.26	0.0916	0.0039	0.7461	0.25	0.13	73.08	133.37	0	3.00	5.00	6.94	12.88	9.91
CN_19	Shared	58.61	2.00	0.0361	0.0036	0.6606	0.00	1.00	152.85	213.14	0	3.00	4.00	1.71	0.00	0.85
CN_20	Sidewalk	85.35	2.74	0.0486	0.0036	0.8146	0.20	0.00	152.35	354.22	1	4.00	3.50	6.44	5.27	5.86
CN_21	Sidewalk	120.76	2.54	0.0482	0.0038	0.7979	0.33	0.00	49.30	251.17	1	4.00	4.00	4.97	6.62	5.80
CN_22	Sidewalk	63.08	5.64	0.0849	0.0043	0.7926	0.75	0.00	90.67	114.96	1	5.00	4.00	26.95	56.28	41.61
CN_23	Walkway	28.42	3.75	0.0487	0.0043	0.7693	1.00	0.00	85.09	48.85	1	5.00	5.00	31.67	51.02	41.34
CN_24	Sidewalk	75.89	5.40	0.0906	0.0041	0.7766	1.00	0.00	75.66	105.75	1	4.00	5.00	26.35	21.74	24.05
CN_25	Sidewalk	48.42	4.21	0.1030	0.0040	0.7821	0.67	0.33	1.59	78.65	1	4.00	4.00	17.55	17.55	17.55
CN_26	Sidewalk	44.10	3.33	0.0741	0.0040	0.7892	1.00	0.00	47.86	74.18	1	4.50	5.00	9.07	10.20	9.64
CN_27	Sidewalk	221.76	3.65	0.0617	0.0038	0.8290	0.56	0.00	73.72	175.56	1	4.00	4.00	14.88	9.92	12.40
CN_28	Sidewalk	83.57	2.37	0.0553	0.0038	0.8272	0.80	0.00	155.69	339.57	1	4.00	4.00	26.92	50.86	38.89
CN_29	Sidewalk	105.06	4.09	0.0561	0.0036	0.8123	0.67	0.00	120.53	450.36	1	4.50	4.00	11.42	29.51	20.46
CN_30	Shared	122.82	2.00	0.0672	0.0036	0.8026	0.85	0.05	93.78	448.36	0	1.50	3.50	27.68	45.19	36.44
CN_31	Shared	61.93	2.00	0.0715	0.0037	0.7438	0.60	0.10	203.92	413.88	0	1.50	2.00	4.04	14.53	9.28
CN_32	Shared	78.05	2.00	0.0318	0.0035	0.6590	0.00	1.00	273.92	465.51	0	3.00	4.00	1.28	1.28	1.28
CN_33	Shared	88.10	2.00	0.0715	0.0036	0.7710	0.20	0.40	278.94	382.43	0	2.00	2.00	1.14	4.54	2.84
CN_34	Shared	115.06	2.00	0.0516	0.0035	0.7726	0.11	0.44	326.26	395.91	0	2.00	3.00	2.17	0.87	1.52
CN_35	Shared	98.23	2.00	0.0280	0.0034	0.6952	0.00	0.75	317.85	502.56	0	2.00	3.00	3.56	2.55	3.05
CN_36	Shared	85.95	2.00	0.0206	0.0034	0.7145	0.43	0.29	225.76	412.99	0	2.00	3.00	4.07	16.29	10.18
CN_37	Shared	135.35	2.00	0.0441	0.0036	0.7242	0.69	0.19	115.11	352.09	0	2.00	2.00	10.71	12.93	11.82
CN_38	Sidewalk	173.55	3.50	0.0445	0.0037	0.8146	0.20	0.00	42.04	373.89	1	4.00	4.00	6.63	5.47	6.05
CN_39	Sidewalk	45.53	2.46	0.0666	0.0035	0.8928	0.00	0.00	151.58	483.43	1	5.00	4.00	1.10	1.10	1.10
CN_40	Sidewalk	72.05	3.73	0.0663	0.0039	0.7375	0.80	0.10	86.69	245.16	1	4.00	4.00	13.19	24.29	18.74
CN_41	Sidewalk	59.59	1.57	0.0606	0.0042	0.7647	0.00	0.00	156.34	169.37	1	5.00	3.00	2.52	2.52	2.52
CN_42	Sidewalk	87.88	3.61	0.1157	0.0045	0.7798	0.67	0.00	179.91	86.21	1	4.00	4.00	17.07	15.93	16.50
CN_43	Walkway	136.13	5.88	0.0989	0.0045	0.8011	1.00	0.00	153.31	68.07	1	5.00	5.00	102.84	34.53	68.68
CN_44	Walkway	60.86	6.00	0.1237	0.0045	0.8482	1.00	0.00	72.05	149.33	1	5.00	5.00	46.83	52.58	49.70

ID	Path Type	Length (m)	Width (m)	Betweenness	Closeness	Straightness	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Mod. Con.	Path Obst.	PDR (am)	PDR (midday)	PDR (average)
CN_45	Sidewalk	276.08	3.76	0.0409	0.0039	0.8173	0.63	0.05	48.77	363.75	1	4.00	4.00	18.65	13.40	16.03
CN_46	Sidewalk	40.82	3.88	0.0807	0.0037	0.8306	0.67	0.17	109.68	466.56	1	5.00	4.00	14.70	23.27	18.99
CN_47	Sidewalk	220.54	1.96	0.0305	0.0039	0.8000	0.79	0.00	193.95	335.98	1	4.00	4.00	6.12	18.82	12.47
CN_48	Sidewalk	23.90	2.08	0.1041	0.0045	0.8004	0.75	0.00	108.77	245.07	1	5.00	5.00	20.92	27.20	24.06
CN_49	Sidewalk	29.67	2.01	0.1006	0.0045	0.8011	0.67	0.00	81.99	271.86	1	5.00	5.00	15.17	11.80	13.48
CN_50	Sidewalk	21.02	2.08	0.1017	0.0043	0.8116	1.00	0.00	56.64	297.20	1	5.00	5.00	14.27	30.92	22.60
CN_51	Shared	80.09	6.33	0.0869	0.0042	0.7694	1.00	0.00	86.17	347.76	0	3.00	4.00	78.04	50.57	64.30
CN_52	Sidewalk	95.59	5.00	0.0333	0.0040	0.7592	0.17	0.00	18.51	372.95	1	4.00	4.00	4.71	6.80	5.75
CN_53	Sidewalk	48.39	5.00	0.0531	0.0043	0.7117	0.00	0.00	90.50	300.96	1	3.50	4.00	3.10	2.07	2.58
CN_54	Sidewalk	28.02	5.00	0.0731	0.0045	0.7164	0.33	0.00	128.71	262.76	1	4.50	4.00	12.49	7.14	9.81
CN_55	Sidewalk	47.65	4.24	0.1118	0.0042	0.7790	1.00	0.00	92.18	99.00	1	5.00	3.50	37.78	32.53	35.15
CN_56	Shared	50.47	2.00	0.0842	0.0040	0.7664	0.78	0.00	93.59	112.01	0	1.50	3.00	11.89	10.90	11.39
CN_57	Shared	60.46	2.00	0.0476	0.0037	0.7406	0.60	0.20	149.05	167.47	0	2.00	3.00	3.31	14.89	9.10
CN_58	Shared	40.43	2.00	0.0541	0.0037	0.7681	0.25	0.25	199.49	217.92	0	2.00	3.00	6.18	1.24	3.71
CN_59	Shared	15.91	2.00	0.0565	0.0036	0.7887	0.33	0.67	227.67	246.09	0	2.00	2.50	0.00	6.29	3.14
CN_60	Shared	84.34	2.00	0.0667	0.0036	0.8061	0.30	0.20	277.79	296.21	0	2.00	3.00	1.19	2.37	1.78
CN_61	Shared	115.97	2.00	0.0356	0.0034	0.7480	0.53	0.20	240.77	312.03	0	2.50	3.50	3.45	6.90	5.17
CN_62	Shared	86.74	2.00	0.0386	0.0038	0.7436	0.60	0.10	77.24	150.27	0	3.00	3.50	3.46	9.80	6.63
CN_63	Sidewalk	27.30	2.23	0.0604	0.0040	0.7745	0.88	0.00	47.52	93.25	1	4.00	4.00	16.48	21.98	19.23
CN_64	Sidewalk	57.29	3.72	0.0530	0.0039	0.7844	0.88	0.00	5.22	83.93	1	4.50	4.00	14.84	16.58	15.71
CN_65	Sidewalk	42.58	3.72	0.0782	0.0038	0.8266	1.00	0.00	44.72	76.57	1	5.00	4.00	25.83	16.44	21.14
CN_66	Shared (Defacto)	20.34	2.20	0.0678	0.0038	0.8186	1.00	0.00	76.18	108.03	0	3.00	4.00	22.12	27.04	24.58
CN_67	Shared	40.96	2.00	0.0504	0.0038	0.7666	0.88	0.13	106.82	138.68	0	4.00	4.00	21.97	40.28	31.13
CN_68	Pedestrian	81.97	3.40	0.0617	0.0037	0.7464	1.00	0.00	168.28	200.14	1	5.00	5.00	58.56	74.42	66.49
CN_69	Pedestrian	24.79	3.40	0.0633	0.0037	0.7544	1.00	0.00	221.66	253.52	1	5.00	5.00	70.59	40.34	55.47
CN_70	Pedestrian	117.00	3.40	0.0648	0.0037	0.7596	1.00	0.00	231.46	324.41	1	5.00	5.00	54.70	89.74	72.22
CN_71	Pedestrian	149.95	4.25	0.0497	0.0037	0.7762	1.00	0.00	135.62	340.89	1	5.00	5.00	55.02	54.02	54.52
CN_72	Sidewalk	105.35	3.27	0.0606	0.0036	0.8210	0.67	0.33	96.54	451.11	1	5.00	5.00	17.56	20.41	18.98
CN_73	Sidewalk	112.27	3.28	0.0365	0.0036	0.8046	0.70	0.00	4.51	348.14	1	5.00	4.00	6.68	16.92	11.80
CN_74	Sidewalk	175.07	2.01	0.0716	0.0038	0.8467	0.44	0.00	153.54	185.40	1	4.00	3.00	7.14	4.00	5.57
CN_75	Shared	173.80	2.00	0.0388	0.0037	0.8030	0.60	0.00	138.53	205.10	0	3.00	4.00	13.23	6.62	9.93
CN_76	Shared	103.66	2.00	0.0529	0.0036	0.8279	0.50	0.00	124.13	515.59	0	4.00	4.00	7.24	7.24	7.24
CN_77	Sidewalk	43.02	5.00	0.0212	0.0037	0.8303	0.33	0.00	50.79	442.25	1	4.00	4.00	4.65	4.65	4.65

Appendix J: Manila Datasets

Manila – Carriedo

ID	Path Type	Length (m)	Width (m)	Betweenness	Closeness	Straightness	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Mod. Con.	Path Obst.	PDR (am)	PDR (midday)	PDR (average)
CA_1	Pedestrian	30.48	13.20	0.0588	0.0039	0.8319	1.00	0.00	190.88	50.89	1	5.00	5.00	78.75	259.23	168.99
CA_2	Pedestrian	30.14	12.78	0.0556	0.0039	0.8282	1.00	0.00	221.19	81.19	1	5.00	5.00	64.69	185.79	125.24
CA_3	Pedestrian	50.10	4.08	0.0475	0.0038	0.8202	1.00	0.00	285.32	145.32	1	5.00	4.00	36.93	92.82	64.87
CA_4	Pedestrian	62.26	2.39	0.0293	0.0038	0.7752	1.00	0.00	194.91	247.12	1	4.00	4.00	48.18	65.85	57.02
CA_5	Pedestrian	29.50	11.05	0.0458	0.0037	0.8021	1.00	0.00	159.00	230.74	1	5.00	5.00	81.37	162.73	122.05
CA_6	Pedestrian	20.05	6.46	0.0435	0.0038	0.8007	1.00	0.00	137.97	255.51	1	5.00	5.00	64.83	129.66	97.25
CA_7	Pedestrian	41.72	6.46	0.0431	0.0038	0.7929	1.00	0.00	148.81	286.40	1	5.00	5.00	65.92	127.04	96.48
CA_8	Pedestrian	35.47	5.84	0.0454	0.0036	0.7950	1.00	0.00	169.31	283.16	1	5.00	5.00	29.60	80.35	54.98
CA_9	Shared (Defacto)	72.94	2.00	0.0394	0.0036	0.8078	0.88	0.00	113.15	299.94	0	2.50	2.00	22.62	34.96	28.79
CA_11	Shared (Defacto)	35.87	2.00	0.0374	0.0037	0.7688	0.70	0.20	30.51	494.94	0	3.00	2.00	27.88	36.24	32.06
CA_12	Shared (Defacto)	62.90	2.00	0.0593	0.0041	0.7764	1.00	0.00	151.27	495.53	0	3.00	4.00	35.77	47.69	41.73
CA_14	Sidewalk	37.41	4.06	0.0769	0.0042	0.7851	0.80	0.00	165.64	472.57	1	2.00	1.00	20.05	21.38	20.72
CA_15	Sidewalk	45.21	4.18	0.0869	0.0042	0.7958	1.00	0.00	124.33	431.26	1	4.00	3.50	24.33	44.24	34.28
CA_16	Sidewalk	33.50	4.06	0.0529	0.0036	0.7820	1.00	0.00	29.33	460.25	1	4.00	4.00	49.25	49.25	49.25
CA_17	Sidewalk	137.80	4.06	0.0524	0.0037	0.8046	1.00	0.00	114.98	512.40	1	4.50	4.00	30.48	42.81	36.65
CA_18	Pedestrian	82.82	13.00	0.0662	0.0036	0.8285	1.00	0.00	251.84	377.45	1	4.00	3.50	57.96	115.91	86.93
CA_20	Pedestrian	53.87	11.49	0.0606	0.0035	0.8021	1.00	0.00	278.01	327.63	1	4.00	4.00	63.11	95.60	79.36
CA_21	Pedestrian	45.53	11.83	0.0593	0.0034	0.7966	1.00	0.00	228.31	277.93	1	4.00	4.00	72.48	91.15	81.81
CA_22	Pedestrian	34.48	11.23	0.0595	0.0034	0.7970	1.00	0.00	188.30	237.92	1	4.00	4.00	39.15	59.45	49.30
CA_23	Pedestrian	160.16	10.59	0.0401	0.0036	0.8207	0.83	0.00	250.99	300.61	1	3.00	2.00	74.61	46.83	60.72
CA_24	Shared (Defacto)	21.79	7.38	0.0441	0.0037	0.8413	1.00	0.00	337.57	261.92	0	4.00	4.00	61.96	66.54	64.25
CA_26	Shared (Defacto)	82.70	6.87	0.0392	0.0037	0.8199	0.93	0.00	240.34	261.07	0	3.00	4.00	20.56	57.43	38.99
CA_27	Pedestrian	117.86	5.55	0.0445	0.0038	0.8177	0.95	0.00	265.05	125.06	1	3.00	4.00	30.97	52.60	41.79
CA_28	Sidewalk	85.52	4.55	0.0400	0.0039	0.8247	1.00	0.00	218.40	21.63	1	5.00	4.50	35.08	86.53	60.80
CA_29	Sidewalk	27.31	4.55	0.0408	0.0038	0.8109	1.00	0.00	232.44	44.63	1	5.00	4.50	45.76	100.68	73.22
CA_30	Pedestrian Alley	46.69	2.95	0.0362	0.0038	0.8046	1.00	0.00	269.45	81.64	1	3.00	3.00	22.49	47.12	34.80
CA_31	Shared (Defacto)	47.07	4.54	0.0299	0.0036	0.8366	1.00	0.00	348.09	167.93	0	3.00	4.00	27.62	35.05	31.34
CA_32	Sidewalk	93.96	4.68	0.0355	0.0036	0.8328	1.00	0.00	323.11	201.33	1	4.50	4.00	29.27	59.07	44.17
CA_33	Shared	64.76	2.00	0.0238	0.0035	0.8022	0.00	0.33	275.93	311.60	0	3.00	3.00	8.49	4.63	6.56
CA_34	Shared (Defacto)	32.57	2.00	0.0348	0.0036	0.8383	0.75	0.00	227.26	328.38	0	2.00	2.00	24.56	18.42	21.49
CA_35	Sidewalk	83.85	4.67	0.0372	0.0036	0.8256	0.85	0.00	274.75	269.90	1	4.00	4.00	38.76	43.53	41.14
CA_36	Sidewalk	102.72	2.00	0.0475	0.0037	0.8372	0.83	0.00	284.18	363.19	1	2.50	2.00	19.47	26.77	23.12
CA_37	Sidewalk	82.61	3.38	0.0327	0.0037	0.7834	0.67	0.17	351.41	392.24	1	3.00	2.00	18.76	13.32	16.04
CA_38	Sidewalk	125.14	1.25	0.0231	0.0037	0.8275	0.50	0.00	325.30	219.03	1	2.00	2.00	7.19	7.99	7.59
CA_39	Sidewalk	123.16	1.63	0.0258	0.0037	0.8301	0.53	0.07	316.53	211.40	1	2.00	2.00	8.12	10.56	9.34
CA_40	Shared (Defacto)	65.11	2.00	0.0316	0.0037	0.8117	0.63	0.00	222.39	208.84	0	1.50	2.00	8.45	3.84	6.14
CA_41	Shared (Defacto)	49.09	2.00	0.0285	0.0037	0.8004	0.60	0.00	234.01	265.94	0	2.00	2.00	10.19	20.37	15.28
CA_42	Sidewalk	30.39	1.83	0.0431	0.0038	0.8098	0.80	0.00	236.54	275.61	1	5.00	3.50	21.39	39.49	30.44
CA_43	Sidewalk	34.65	1.63	0.0472	0.0038	0.8280	0.67	0.00	265.67	308.13	1	5.00	3.50	8.66	11.54	10.10
CA_44	Sidewalk	36.11	2.26	0.0537	0.0039	0.8398	0.89	0.00	299.71	354.16	1	3.50	3.00	18.00	42.92	30.46
CA_45	Sidewalk	57.39	1.95	0.0466	0.0039	0.8258	0.80	0.10	346.46	400.91	1	3.00	3.00	12.20	14.81	13.50

ID	Path Type	Length (m)	Width (m)	Betweenness	Closeness	Straightness	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Mod. Con.	Path Obst.	PDR (am)	PDR (midday)	PDR (average)
CA_46	Shared	78.11	2.00	0.0308	0.0038	0.7832	0.38	0.38	204.23	364.34	0	2.00	2.00	2.56	10.88	6.72
CA_47	Shared (Defacto)	75.86	2.00	0.0343	0.0038	0.7811	0.54	0.08	212.46	372.57	0	2.00	2.00	3.30	6.59	4.94
CA_48	Sidewalk	43.15	2.49	0.0681	0.0039	0.8223	0.50	0.00	143.60	303.71	1	2.00	2.00	10.43	10.43	10.43
CA_49	Sidewalk	67.66	1.51	0.0406	0.0038	0.8194	0.71	0.06	169.51	221.98	1	5.00	4.00	12.56	19.21	15.89
CA_50	Sidewalk	69.31	4.63	0.0316	0.0038	0.8306	1.00	0.00	231.64	64.37	1	4.50	4.50	40.40	75.03	57.71
CA_51	Sidewalk	78.40	2.05	0.0322	0.0039	0.8066	0.92	0.00	159.20	68.92	1	4.00	3.00	28.06	24.87	26.47
CA_52	Sidewalk	75.94	4.82	0.0497	0.0039	0.8217	0.92	0.00	190.16	17.11	1	5.00	4.00	35.55	57.28	46.42
CA_53	Sidewalk	41.32	10.00	0.0392	0.0038	0.8248	1.00	0.00	156.22	14.40	1	3.50	3.00	49.61	93.18	71.39
CA_54	Shared (Defacto)	93.45	2.45	0.0362	0.0038	0.8120	0.95	0.00	283.00	184.23	0	3.00	2.00	21.40	29.43	25.42
CA_55	Shared (Defacto)	66.90	2.07	0.0509	0.0046	0.8100	1.00	0.00	274.68	264.41	0	4.00	3.50	28.40	36.62	32.51
CA_56	Shared (Defacto)	40.55	2.00	0.0566	0.0045	0.8267	1.00	0.00	261.50	318.13	1	2.00	2.00	45.62	51.79	48.71
CA_57	Sidewalk	86.71	4.00	0.0473	0.0043	0.7725	0.82	0.00	230.18	381.76	1	3.50	2.00	25.37	29.41	27.39
CA_58	Sidewalk	76.77	4.10	0.0539	0.0041	0.7505	1.00	0.00	148.44	399.78	1	3.00	3.00	29.96	38.42	34.19
CA_59	Sidewalk	30.63	2.00	0.0862	0.0042	0.8423	1.00	0.00	276.29	325.35	1	2.00	3.00	14.69	21.22	17.96
CA_60	Pedestrian	34.80	4.00	0.0631	0.0041	0.8159	1.00	0.00	278.38	327.44	1	3.50	4.00	90.51	81.89	86.20
CA_61	Pedestrian	49.05	4.00	0.0377	0.0040	0.7800	1.00	0.00	320.31	368.19	1	3.00	4.00	74.41	56.06	65.23
CA_62	Sidewalk	76.96	3.53	0.0762	0.0040	0.8190	1.00	0.00	299.46	271.56	1	4.50	3.50	35.08	45.48	40.28
CA_63	Shared (Defacto)	78.89	2.00	0.0472	0.0038	0.8171	0.80	0.00	263.29	193.64	0	1.50	2.00	8.24	17.11	12.68
CA_64	Sidewalk	32.88	5.38	0.0327	0.0037	0.8022	0.75	0.00	112.38	63.60	1	4.00	3.00	42.58	16.73	29.65
CA_65	Sidewalk	51.12	2.02	0.0391	0.0038	0.8093	0.75	0.00	126.63	62.03	1	5.00	3.00	15.65	30.32	22.99
CA_66	Sidewalk	71.24	3.25	0.0320	0.0039	0.7959	0.91	0.00	65.45	104.29	1	4.50	3.00	51.93	32.28	42.11
CA_67	Sidewalk	25.68	2.78	0.0235	0.0040	0.7917	0.50	0.00	16.98	152.75	1	4.50	4.00	31.15	7.79	19.47
CA_68	Sidewalk	41.33	2.54	0.0208	0.0040	0.7919	0.00	0.00	16.52	186.25	1	4.00	4.00	7.26	7.26	7.26
CA_69	Sidewalk	45.49	2.00	0.0648	0.0041	0.8245	0.40	0.00	14.51	206.51	1	1.00	1.00	7.69	8.79	8.24
CA_70	Sidewalk	73.01	2.45	0.0357	0.0039	0.8213	0.50	0.00	4.99	175.60	1	4.00	4.00	21.23	23.29	22.26
CA_71	Sidewalk	63.92	2.80	0.0369	0.0039	0.8155	0.40	0.20	100.81	221.92	1	5.00	4.00	13.30	7.04	10.17
CA_72	Sidewalk	70.73	3.10	0.0532	0.0040	0.8290	0.40	0.20	151.85	256.01	1	4.00	4.00	13.43	14.14	13.78
CA_73	Sidewalk	56.55	2.24	0.0131	0.0040	0.8263	0.60	0.20	153.26	293.82	1	5.00	4.00	17.68	12.38	15.03
CA_74	Shared	73.22	2.00	0.0240	0.0040	0.8435	0.20	0.20	216.98	333.08	0	3.00	2.00	4.78	1.37	3.07
CA_75	Sidewalk	51.91	1.19	0.0336	0.0038	0.7872	0.00	0.00	305.89	425.72	1	2.00	2.00	8.67	5.78	7.22
CA_76	Sidewalk	44.77	1.19	0.0278	0.0038	0.7900	0.00	0.00	311.53	428.50	1	2.00	2.00	8.93	4.47	6.70
CA_77	Sidewalk	43.07	1.81	0.0277	0.0040	0.8071	0.60	0.20	135.93	297.62	1	5.00	4.00	8.13	6.97	7.55
CA_78	Sidewalk	21.01	2.01	0.0162	0.0040	0.8042	0.75	0.00	167.63	329.32	1	5.00	3.00	23.80	16.66	20.23
CA_79	Shared	45.40	2.00	0.0338	0.0040	0.8220	0.60	0.00	200.84	362.53	0	3.00	3.00	4.41	7.71	6.06
CA_80	Shared	113.62	2.00	0.0389	0.0039	0.8147	0.00	0.50	239.62	399.74	0	3.00	2.00	4.84	2.20	3.52
CA_82	Sidewalk	46.72	2.76	0.0509	0.0040	0.8356	0.50	0.00	206.17	366.29	1	2.50	3.00	8.56	6.42	7.49
CA_83	Shared (Defacto)	40.99	2.00	0.0334	0.0036	0.7787	0.50	0.00	193.76	219.33	0	3.50	4.00	18.30	30.50	24.40
CA_84	Pedestrian Bridge	67.88	2.50	0.0308	0.0036	0.7810	0.00	0.00	71.41	409.56	1	5.00	5.00	19.15	24.31	21.73
CA_85	Pedestrian Bridge	87.86	4.00	0.0684	0.0038	0.8257	1.00	0.00	236.05	444.48	1	5.00	5.00	21.06	25.61	23.33

Manila – Pedro Gil

ID	Path Type	Length (m)	Width (m)	Betweenness	Closeness	Straightness	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Mod. Con.	Path Obst.	PDR (am)	PDR (midday)	PDR (average)
PG_1	Sidewalk	49.46	3.12	0.1016	0.0040	0.8640	0.67	0.00	125.33	376.56	1	5.00	4.00	10.11	46.50	28.31
PG_2	Sidewalk	30.99	3.10	0.0859	0.0040	0.8619	0.67	0.00	165.56	336.33	1	5.00	4.00	12.91	30.66	21.78
PG_3	Sidewalk	28.07	3.17	0.0819	0.0041	0.8579	0.67	0.00	206.89	295.00	1	5.00	4.00	16.03	39.19	27.61
PG_4	Sidewalk	49.86	3.17	0.0485	0.0040	0.8474	0.67	0.00	222.15	256.03	1	5.00	4.00	13.04	42.12	27.58
PG_5	Sidewalk	70.76	3.03	0.0594	0.0039	0.8435	0.67	0.00	149.67	183.55	1	5.00	4.00	18.37	42.40	30.38
PG_6	Sidewalk	69.86	2.61	0.0775	0.0039	0.8607	1.00	0.00	67.94	101.82	1	5.00	4.00	36.50	34.35	35.43
PG_7	Sidewalk	44.31	5.53	0.0723	0.0038	0.8188	1.00	0.00	49.00	44.73	1	5.00	4.00	100.43	71.09	85.76
PG_8	Sidewalk	53.40	5.23	0.0640	0.0038	0.7616	1.00	0.00	0.14	49.28	1	5.00	4.00	56.18	29.03	42.60
PG_9	Sidewalk	40.36	4.40	0.0759	0.0038	0.7465	1.00	0.00	46.74	96.16	1	5.00	4.00	34.69	28.49	31.59
PG_10	Sidewalk	68.87	4.40	0.1010	0.0039	0.7743	0.75	0.00	71.12	150.78	1	5.00	4.00	36.30	28.31	32.31
PG_11	Sidewalk	67.74	3.18	0.0881	0.0040	0.7879	0.00	0.00	15.39	229.79	1	5.00	4.00	14.02	14.76	14.39
PG_12	Sidewalk	185.97	1.90	0.0535	0.0037	0.8193	0.00	0.00	111.47	356.64	1	5.00	3.00	9.41	6.99	8.20
PG_13	Sidewalk	145.63	4.56	0.0230	0.0036	0.8356	0.75	0.00	90.96	376.56	1	2.00	2.00	21.63	30.21	25.92
PG_14	Sidewalk	95.99	5.32	0.0615	0.0039	0.8116	0.86	0.00	52.18	255.72	1	2.00	2.50	23.96	31.77	27.87
PG_15	Sidewalk	57.43	5.29	0.0662	0.0040	0.8021	1.00	0.00	35.34	168.19	1	3.00	4.00	72.26	61.81	67.04
PG_16	Sidewalk	96.43	5.23	0.0608	0.0039	0.7852	0.88	0.00	89.65	79.92	1	3.50	3.50	50.30	37.85	44.07
PG_17	Sidewalk	44.25	5.54	0.0680	0.0038	0.8217	1.00	0.00	19.31	53.83	1	5.00	4.00	66.67	100.56	83.62
PG_18	Sidewalk	158.03	3.90	0.0377	0.0038	0.8590	0.33	0.00	49.28	167.34	1	4.00	4.00	23.73	25.00	24.36
PG_19	Sidewalk	112.97	3.33	0.0489	0.0038	0.8541	0.00	0.00	97.34	313.95	1	3.50	3.00	26.56	25.67	26.11
PG_20	Sidewalk	114.70	1.91	0.0314	0.0038	0.8550	0.71	0.12	182.80	391.82	1	2.00	2.00	20.05	10.90	15.48
PG_21	Sidewalk	149.23	2.52	0.0395	0.0037	0.8552	0.60	0.20	175.46	248.60	1	3.50	2.00	29.82	14.41	22.11
PG_22	Sidewalk	148.93	2.49	0.0289	0.0037	0.8341	0.50	0.17	162.77	235.91	1	3.50	2.00	11.08	15.44	13.26
PG_23	Sidewalk	164.22	2.58	0.0429	0.0038	0.8061	0.29	0.47	233.27	307.98	1	2.50	2.00	10.05	8.53	9.29
PG_24	Sidewalk	76.83	2.93	0.0556	0.0037	0.8068	0.43	0.14	138.59	342.13	1	3.00	2.50	14.32	17.57	15.94
PG_25	Sidewalk	142.69	1.92	0.0187	0.0036	0.8055	0.11	0.44	157.11	452.01	1	2.00	2.00	0.70	2.80	1.75
PG_26	Sidewalk	142.39	1.98	0.0374	0.0037	0.8074	0.00	0.00	168.86	463.78	1	2.00	1.00	1.76	4.92	3.34
PG_27	Sidewalk	163.49	1.99	0.0264	0.0037	0.8210	0.00	0.57	300.64	375.26	1	3.00	2.00	3.06	7.03	5.05
PG_28	Sidewalk	163.35	2.48	0.0352	0.0037	0.8224	0.33	0.11	310.94	385.45	1	2.50	2.00	5.82	7.35	6.58
PG_29	Sidewalk	156.50	2.08	0.0329	0.0037	0.8454	0.31	0.50	246.48	319.62	1	3.00	2.50	10.22	8.63	9.42
PG_30	Sidewalk	69.83	3.46	0.0285	0.0037	0.8598	0.88	0.00	123.22	196.36	1	4.50	3.00	35.80	51.55	43.68
PG_31	Sidewalk	73.47	2.78	0.0412	0.0038	0.8586	0.78	0.00	51.92	125.06	1	4.00	4.00	38.11	51.72	44.92
PG_32	Sidewalk	73.24	2.67	0.0709	0.0038	0.8612	1.00	0.00	39.43	112.58	1	3.50	3.50	38.23	50.52	44.37
PG_33	Sidewalk	74.97	2.55	0.0542	0.0039	0.8030	0.56	0.11	101.55	176.96	1	5.00	5.00	18.67	20.01	19.34
PG_34	Sidewalk	67.73	2.37	0.0297	0.0037	0.8196	0.33	0.00	185.02	259.74	1	3.00	3.00	7.38	15.50	11.44
PG_35	Sidewalk	66.76	2.29	0.0404	0.0037	0.8366	0.00	0.00	262.65	337.15	1	3.00	3.00	4.49	3.74	4.12
PG_36	Sidewalk	162.88	2.75	0.0381	0.0037	0.8258	0.10	0.00	377.46	451.75	1	2.50	2.00	2.15	3.99	3.07
PG_37	Sidewalk	68.64	1.66	0.0307	0.0037	0.8129	0.17	0.50	309.36	510.17	1	2.00	2.00	0.73	0.73	0.36
PG_38	Sidewalk	89.45	2.33	0.0469	0.0037	0.8570	0.50	0.33	430.22	500.08	1	2.00	2.00	3.35	4.47	3.91
PG_39	Sidewalk	170.40	2.46	0.0225	0.0038	0.8428	0.07	0.43	413.78	486.92	1	2.00	2.00	2.05	1.47	1.76
PG_40	Sidewalk	58.59	2.43	0.0240	0.0039	0.8414	0.50	0.00	357.87	431.01	1	2.50	2.50	12.80	1.71	7.25
PG_41	Sidewalk	163.79	2.01	0.0331	0.0037	0.8529	0.36	0.36	331.36	404.50	1	1.50	2.00	10.38	7.33	8.85
PG_42	Sidewalk	68.01	2.62	0.0546	0.0039	0.8523	0.00	0.00	296.23	369.37	1	2.00	2.00	4.41	2.94	3.68
PG_43	Sidewalk	131.76	2.09	0.0430	0.0040	0.8392	0.00	0.00	396.11	469.25	1	2.00	2.00	1.52	1.90	1.71
PG_44	Sidewalk	130.97	2.33	0.0581	0.0039	0.8404	0.70	0.10	406.54	479.68	1	3.00	3.00	16.42	11.45	13.93

ID	Path Type	Length (m)	Width (m)	Betweenness	Closeness	Straightness	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Mod. Con.	Path Obst.	PDR (am)	PDR (midday)	PDR (average)
PG_45	Sidewalk	35.73	2.00	0.0198	0.0040	0.8295	0.33	0.00	326.04	520.53	1	3.50	2.00	58.77	13.99	36.38
PG_46	Sidewalk	30.69	2.00	0.0296	0.0040	0.8356	0.50	0.00	292.84	487.33	1	3.50	2.00	32.58	37.47	35.03
PG_47	Sidewalk	68.72	1.89	0.0351	0.0039	0.8434	0.40	0.20	228.36	431.51	1	3.50	2.00	6.55	10.19	8.37
PG_48	Sidewalk	112.98	2.11	0.0651	0.0041	0.8462	0.08	0.54	330.29	527.43	1	2.00	2.00	2.66	5.75	4.20
PG_49	Sidewalk	113.23	2.00	0.0487	0.0039	0.8487	0.18	0.73	261.65	465.33	1	2.00	1.00	8.83	2.21	5.52
PG_50	Sidewalk	34.08	2.00	0.0466	0.0039	0.8517	0.60	0.40	290.41	500.44	1	4.50	2.50	20.54	24.94	22.74
PG_51	Shared	114.07	2.00	0.0386	0.0039	0.8483	0.29	0.71	217.52	426.36	0	2.50	2.00	11.83	7.01	9.42
PG_52	Sidewalk	73.23	2.00	0.0310	0.0037	0.8553	0.50	0.00	66.35	282.97	1	2.00	2.00	8.19	12.29	10.24
PG_53	Sidewalk	71.33	2.39	0.0313	0.0037	0.8596	0.60	0.00	229.76	410.80	1	3.50	2.50	9.11	21.73	15.42
PG_54	Shared (Defacto)	112.77	2.00	0.0511	0.0037	0.8589	0.40	0.00	126.38	307.42	0	1.00	1.00	5.76	19.95	12.86
PG_55	Sidewalk	71.08	1.59	0.0389	0.0037	0.8573	0.00	0.00	105.54	286.58	1	1.00	1.00	1.41	2.81	2.11
PG_56	Sidewalk	113.84	2.54	0.0286	0.0037	0.8552	0.38	0.25	208.97	389.97	1	3.00	3.00	10.98	55.78	33.38
PG_57	Sidewalk	74.44	1.76	0.0209	0.0037	0.8519	0.00	0.50	189.27	370.27	1	3.00	2.50	10.75	1.34	6.05
PG_58	Sidewalk	114.01	1.65	0.0324	0.0037	0.8578	0.00	0.67	295.61	476.48	0	2.00	1.00	4.82	0.44	2.63
PG_59	Sidewalk	75.09	2.38	0.0534	0.0038	0.8501	0.25	0.00	265.17	445.69	1	3.50	3.00	2.66	9.99	6.33
PG_60	Sidewalk	23.74	1.92	0.0385	0.0038	0.8408	0.00	0.00	326.15	506.67	1	4.00	3.00	2.11	6.32	4.21
PG_61	Sidewalk	55.41	1.87	0.0412	0.0038	0.8369	0.00	0.00	329.55	546.25	1	4.00	3.00	2.71	3.61	3.16
PG_62	Sidewalk	188.02	1.88	0.0515	0.0038	0.8472	0.00	0.00	207.84	508.37	1	4.00	3.00	4.52	5.05	4.79
PG_63	Sidewalk	80.50	2.49	0.0468	0.0040	0.8552	0.50	0.00	154.08	374.11	1	4.00	4.00	14.29	26.09	20.19
PG_64	Sidewalk	180.73	1.59	0.0375	0.0039	0.8497	0.00	0.00	284.69	424.23	1	2.00	1.50	0.83	4.15	2.49
PG_65	Sidewalk	179.87	2.23	0.0670	0.0039	0.8506	0.50	0.00	296.09	411.69	1	3.00	3.00	8.90	7.78	8.34
PG_66	Sidewalk	27.97	2.23	0.0721	0.0040	0.8479	0.80	0.00	220.14	307.78	1	4.00	3.00	23.24	19.66	21.45
PG_67	Sidewalk	49.42	2.21	0.0644	0.0040	0.8423	1.00	0.00	234.58	269.08	1	3.00	2.00	20.23	27.32	23.78
PG_68	Sidewalk	172.74	1.80	0.0553	0.0039	0.8454	0.13	0.50	296.24	330.75	1	2.00	1.50	3.18	5.79	4.49
PG_69	Sidewalk	113.70	1.90	0.0307	0.0038	0.8545	0.33	0.00	170.92	380.68	1	2.00	2.00	3.52	7.04	5.28
PG_70	Sidewalk	163.86	1.75	0.0458	0.0039	0.8070	0.20	0.60	220.96	295.89	1	2.00	2.00	2.14	2.75	2.44

Manila – Roosevelt

ID	Path Type	Length (m)	Width (m)	Betweenness	Closeness	Straightness	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Mod. Con.	Path Obst.	PDR (am)	PDR (midday)	PDR (average)
RO_1	Sidewalk	90.57	2.61	0.0285	0.0039	0.7143	0.90	0.00	111.46	97.02	1	3.00	4.00	60.73	45.27	60.73
RO_2	Sidewalk	51.28	2.35	0.0326	0.0036	0.7141	1.00	0.00	40.53	76.42	1	3.00	3.00	35.10	27.30	35.10
RO_3	Sidewalk	51.36	3.41	0.0373	0.0035	0.7174	0.90	0.00	10.79	76.46	1	5.00	4.00	122.66	83.72	122.66
RO_4	Sidewalk	243.08	2.39	0.0244	0.0035	0.7604	0.27	0.00	158.00	223.68	1	3.00	3.00	21.80	4.11	21.80
RO_5	Sidewalk	43.30	0.81	0.0456	0.0040	0.8509	0.57	0.14	368.28	475.50	1	2.50	2.50	4.62	8.08	4.62
RO_6	Shared	41.05	0.70	0.0411	0.0040	0.8421	0.40	0.20	419.04	526.26	0	2.00	2.00	2.44	8.53	2.44
RO_7	Sidewalk	99.00	1.41	0.0435	0.0039	0.8243	0.71	0.29	482.26	547.93	1	3.00	2.00	6.57	10.61	6.57
RO_8	Sidewalk	93.55	0.78	0.0572	0.0040	0.8210	0.57	0.29	496.95	562.62	1	2.50	2.00	1.60	5.88	1.60
RO_9	Sidewalk	186.73	1.51	0.0647	0.0040	0.8190	0.19	0.81	446.13	530.16	1	2.00	2.00	1.61	2.41	1.61
RO_10	Sidewalk	183.52	1.51	0.0465	0.0040	0.8183	0.00	0.67	452.87	536.54	1	2.00	2.00	1.36	1.09	1.36
RO_11	Sidewalk	42.03	1.55	0.0648	0.0042	0.8388	0.13	0.88	331.75	516.88	1	3.00	2.00	1.19	1.19	1.19
RO_12	Sidewalk	44.49	1.61	0.0371	0.0042	0.8413	0.00	1.00	330.05	526.01	1	3.00	3.00	2.25	2.25	2.25
RO_13	Sidewalk	203.28	1.55	0.0604	0.0042	0.8145	0.03	0.97	412.38	497.18	1	2.00	2.00	0.74	0.49	0.74
RO_14	Sidewalk	206.48	1.61	0.0636	0.0042	0.8158	0.05	0.92	405.71	490.69	1	2.00	2.00	0.48	0.48	0.48
RO_15	Sidewalk	152.45	1.64	0.0469	0.0040	0.8194	0.27	0.73	414.24	479.91	1	2.00	2.00	3.94	0.98	3.94
RO_16	Sidewalk	41.39	1.45	0.0624	0.0041	0.8230	0.00	1.00	301.08	366.76	1	2.00	2.00	1.21	0.60	1.21
RO_17	Sidewalk	103.57	1.38	0.0368	0.0041	0.7903	0.20	0.70	335.70	466.74	1	2.50	2.00	3.38	1.45	3.38
RO_18	Sidewalk	52.17	1.28	0.0557	0.0043	0.8205	0.20	0.80	285.51	470.64	1	3.00	3.00	4.79	0.96	4.79
RO_19	Sidewalk	52.32	1.36	0.0559	0.0043	0.8178	0.29	0.71	277.08	462.21	1	4.00	4.00	6.69	1.91	6.69
RO_20	Sidewalk	42.80	1.48	0.0627	0.0043	0.8403	0.13	0.88	278.12	474.08	1	5.00	3.00	1.17	2.34	1.17
RO_21	Sidewalk	41.79	1.51	0.0627	0.0043	0.8454	0.29	0.71	236.05	473.57	1	2.00	2.00	1.20	2.39	0.00
RO_22	Sidewalk	95.11	1.49	0.0428	0.0041	0.8335	0.07	0.93	254.42	535.76	1	2.00	2.00	3.15	0.53	3.15
RO_23	Sidewalk	46.27	1.72	0.0530	0.0040	0.8447	0.50	0.33	175.03	486.56	1	2.00	2.00	11.89	4.32	11.89
RO_24	Sidewalk	24.93	1.72	0.0577	0.0040	0.8590	0.60	0.20	139.43	450.96	1	4.00	3.50	24.07	6.02	24.07
RO_25	Sidewalk	147.43	1.60	0.0607	0.0041	0.8117	0.44	0.56	151.95	409.61	1	2.50	2.00	7.12	7.12	7.12
RO_26	Sidewalk	44.66	1.47	0.0719	0.0040	0.7913	1.00	0.00	100.57	344.44	1	5.00	3.00	7.84	6.72	7.84
RO_27	Sidewalk	47.17	1.26	0.0667	0.0041	0.8072	0.09	0.91	146.48	345.69	1	2.00	2.00	1.06	1.06	1.06
RO_28	Sidewalk	70.07	1.31	0.0591	0.0043	0.8335	0.17	0.75	213.61	412.82	1	2.00	2.00	0.71	7.14	0.71
RO_29	Sidewalk	46.07	1.24	0.0449	0.0041	0.7993	0.14	0.86	209.63	394.76	1	2.00	2.00	1.09	2.17	0.00
RO_30	Sidewalk	90.60	1.24	0.0375	0.0041	0.7860	0.20	0.00	277.97	463.10	1	3.00	2.00	3.31	4.42	3.31
RO_31	Sidewalk	71.48	1.44	0.0492	0.0041	0.8214	0.17	0.83	307.73	373.41	1	4.00	3.00	1.40	1.40	1.40
RO_32	Sidewalk	43.24	1.61	0.0735	0.0041	0.8402	0.50	0.50	258.52	324.19	1	4.00	3.00	9.25	8.09	9.25
RO_33	Sidewalk	85.61	1.88	0.0427	0.0040	0.8284	0.08	0.85	345.37	411.05	1	2.50	2.00	9.34	0.58	9.34
RO_34	Sidewalk	84.32	1.72	0.0428	0.0039	0.8041	0.00	0.00	176.78	242.45	1	3.50	3.00	2.96	1.19	2.96
RO_35	Sidewalk	45.81	2.35	0.0398	0.0040	0.7864	0.80	0.00	92.18	335.37	1	2.00	2.00	31.65	24.01	31.65
RO_36	Sidewalk	64.42	2.35	0.0620	0.0039	0.8130	1.00	0.00	29.41	287.06	1	5.00	4.00	50.45	44.24	50.45
RO_37	Sidewalk	84.71	3.20	0.0840	0.0040	0.8268	1.00	0.00	45.16	212.50	1	5.00	5.00	67.29	63.75	67.29
RO_38	Sidewalk	176.25	3.12	0.0143	0.0038	0.8431	0.50	0.00	10.96	381.05	1	4.50	3.50	23.26	16.17	23.26
RO_39	Sidewalk	188.57	3.01	0.0224	0.0036	0.8475	0.73	0.00	47.46	328.60	1	3.00	2.50	25.45	14.05	25.45
RO_40	Sidewalk	114.71	2.55	0.0342	0.0040	0.7874	0.88	0.00	149.78	285.98	1	2.50	2.50	25.28	27.02	25.28
RO_41	Shared (Defacto)	65.07	5.50	0.0237	0.0037	0.7823	0.90	0.05	157.42	366.78	0	3.00	2.00	19.98	35.35	19.98
RO_42	Shared (Defacto)	200.32	2.00	0.0225	0.0036	0.7717	0.41	0.51	201.86	499.47	0	3.00	2.00	6.74	12.73	6.74
RO_43	Shared (Defacto)	135.76	2.00	0.0266	0.0036	0.7616	0.03	0.97	125.42	467.20	0	2.50	1.00	1.84	2.58	1.84
RO_44	Sidewalk	67.19	3.05	0.0629	0.0039	0.8294	0.83	0.00	4.36	416.45	1	2.00	2.00	16.37	23.07	16.37

ID	Path Type	Length (m)	Width (m)	Betweenness	Closeness	Straightness	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Mod. Con.	Path Obst.	PDR (am)	PDR (midday)	PDR (average)
RO_45	Sidewalk	21.00	3.75	0.0517	0.0043	0.8326	1.00	0.00	178.26	242.55	1	5.00	5.00	52.38	61.90	52.38
RO_46	Sidewalk	22.06	3.56	0.0504	0.0042	0.8240	1.00	0.00	167.69	221.02	1	5.00	5.00	38.53	34.00	38.53
RO_47	Sidewalk	20.63	3.26	0.0500	0.0042	0.8184	1.00	0.00	146.35	199.68	1	4.00	3.50	50.90	38.78	50.90
RO_48	Sidewalk	24.91	3.65	0.0848	0.0042	0.8099	1.00	0.00	96.52	137.95	1	5.00	4.00	100.36	78.28	100.36
RO_49	Sidewalk	249.72	3.55	0.0219	0.0035	0.8032	0.63	0.11	2.57	229.70	1	3.00	2.50	23.43	15.62	23.43
RO_50	Sidewalk	88.57	2.49	0.0214	0.0035	0.8295	0.70	0.00	188.37	420.64	1	4.00	3.00	9.03	9.60	9.03
RO_51	Sidewalk	129.66	2.15	0.0154	0.0036	0.8420	0.15	0.54	286.64	392.89	1	3.00	2.50	5.40	3.47	5.40
RO_52	Sidewalk	124.32	2.10	0.0178	0.0037	0.8268	0.25	0.63	247.71	265.90	1	2.50	2.50	1.61	4.83	1.61
RO_53	Shared	98.89	2.00	0.0355	0.0038	0.8196	0.57	0.00	136.10	154.29	0	3.00	3.00	8.60	5.56	8.60
RO_54	Sidewalk	87.45	1.65	0.0211	0.0040	0.8066	0.00	0.00	229.27	247.46	1	2.00	2.00	2.86	5.72	2.86
RO_55	Sidewalk	26.30	2.01	0.0733	0.0044	0.7969	1.00	0.00	180.43	221.86	1	5.00	4.00	51.33	20.91	51.33
RO_56	Sidewalk	26.30	2.00	0.0840	0.0045	0.8062	1.00	0.00	180.43	221.86	1	5.00	4.00	38.02	20.91	38.02
RO_57	Sidewalk	43.16	2.03	0.0505	0.0044	0.8248	1.00	0.00	189.34	251.66	1	5.00	4.00	17.38	12.74	17.38
RO_58	Sidewalk	46.69	1.76	0.0774	0.0043	0.7960	1.00	0.00	235.91	277.34	1	5.00	3.00	23.56	17.13	23.56
RO_59	Sidewalk	124.65	2.23	0.0342	0.0038	0.8265	0.38	0.50	259.27	277.46	1	4.00	3.00	12.03	9.63	12.03
RO_60	Sidewalk	129.08	2.39	0.0296	0.0036	0.8448	0.22	0.56	298.59	404.32	1	2.00	2.00	4.65	3.10	4.65
RO_61	Pedestrian Alley	42.69	2.00	0.0215	0.0037	0.8343	0.00	1.00	342.94	361.13	0	3.00	2.00	2.34	1.17	2.34
RO_62	Sidewalk	41.59	1.29	0.0168	0.0038	0.8209	0.00	1.00	283.76	301.95	1	2.00	2.00	2.40	1.20	2.40
RO_63	Sidewalk	59.51	1.27	0.0597	0.0038	0.8328	0.00	1.00	342.33	360.52	1	2.00	2.00	1.68	0.84	1.68
RO_64	Sidewalk	53.72	1.57	0.0456	0.0039	0.8515	0.11	0.89	315.65	527.41	1	2.50	2.00	0.93	5.58	0.93
RO_65	Sidewalk	83.21	1.48	0.0547	0.0039	0.8527	0.00	1.00	396.25	476.30	1	5.00	2.00	1.20	1.20	1.20
RO_66	Sidewalk	86.67	1.48	0.0430	0.0039	0.8537	0.00	1.00	390.22	485.78	1	2.00	2.00	1.15	1.15	1.15
RO_67	Shared	99.41	2.00	0.0527	0.0041	0.8235	0.10	0.86	483.08	520.72	0	3.00	3.50	3.02	1.51	3.02
RO_68	Sidewalk	50.62	1.85	0.0350	0.0038	0.8128	0.00	1.00	325.50	477.67	1	2.00	2.00	0.99	7.90	0.00
RO_69	Shared	82.94	2.00	0.0484	0.0039	0.8109	0.06	0.94	341.66	411.75	0	3.00	4.00	3.62	8.44	3.62
RO_70	Pedestrian Alley	50.33	3.00	0.0463	0.0040	0.8040	0.20	0.80	377.25	395.44	0	3.00	5.00	4.97	5.96	4.97
RO_71	Shared	139.19	2.00	0.0576	0.0039	0.8229	0.00	1.00	441.67	459.86	0	3.00	4.00	0.36	0.72	0.36
RO_72	Sidewalk	44.24	1.41	0.0330	0.0039	0.8290	0.20	0.80	268.29	376.70	1	4.00	3.00	2.26	1.13	2.26
RO_73	Sidewalk	43.62	1.35	0.0371	0.0038	0.8401	0.00	1.00	218.19	486.95	1	5.00	3.00	1.15	1.15	1.15
RO_74	Sidewalk	114.48	1.44	0.0539	0.0039	0.8367	0.00	1.00	138.31	421.62	1	2.00	2.00	0.44	1.75	0.44
RO_75	Shared (Defacto)	65.49	2.00	0.0454	0.0040	0.8256	0.70	0.20	113.81	331.63	0	2.00	2.00	9.93	21.38	9.93
RO_76	Shared	63.22	2.00	0.0313	0.0042	0.8213	0.00	0.00	178.17	325.39	0	3.00	3.00	1.58	1.58	1.58
RO_77	Shared (Defacto)	47.89	2.00	0.0743	0.0044	0.8100	0.90	0.10	228.41	269.84	0	4.00	3.00	20.88	41.76	20.88
RO_78	Sidewalk	42.07	1.57	0.0480	0.0040	0.8321	0.33	0.50	363.55	575.30	1	2.50	2.00	1.19	3.57	1.19
RO_79	Sidewalk	88.52	3.24	0.0270	0.0038	0.7973	0.92	0.00	75.78	277.34	1	5.00	4.00	15.02	39.54	15.02
RO_80	Shared (Defacto)	57.98	3.50	0.0355	0.0044	0.8203	1.00	0.00	175.55	269.90	0	4.50	4.00	50.02	50.02	50.02

Appendix K: Osaka Datasets

Osaka – Namba

ID	Path Type	Length (m)	Width (m)	Betweenness	Closeness	Straightness	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Mod. Con.	Path Obst.	PDR (am)	PDR (midday)	PDR (average)
NA_1	Sidewalk	54.57	5.91	0.0415	0.0038	0.7897	0.50	0.00	152.96	27.29	1	4.50	4.50	6.41	16.49	11.45
NA_2	Shared	47.11	2.00	0.0288	0.0038	0.7747	0.33	0.00	141.69	71.73	0	3.00	4.00	0.01	9.55	4.78
NA_3	Pedestrian Alley	65.18	2.30	0.0137	0.0038	0.7444	0.56	0.11	112.60	127.87	0	3.00	3.00	0.01	1.53	0.77
NA_4	Shared	69.55	2.00	0.0307	0.0038	0.7822	0.94	0.00	64.83	135.20	0	3.00	4.00	2.88	13.66	8.27
NA_5	Shared	61.72	2.00	0.0261	0.0037	0.7795	0.75	0.06	60.91	94.90	0	3.00	4.00	2.43	8.91	5.67
NA_6	Shared	62.95	2.00	0.0267	0.0038	0.7753	0.75	0.00	123.25	72.86	0	3.00	4.00	0.79	4.77	2.78
NA_7	Shared	65.52	2.00	0.0417	0.0039	0.7909	0.50	0.00	139.61	52.78	0	3.00	4.00	5.34	8.39	6.87
NA_8	Sidewalk	131.92	4.66	0.0249	0.0037	0.7908	1.00	0.00	10.23	65.96	1	4.00	4.00	13.27	7.20	10.23
NA_9	Sidewalk	29.42	4.02	0.0359	0.0038	0.8248	1.00	0.00	6.85	21.11	1	4.50	4.50	67.98	23.79	45.89
NA_10	Sidewalk	25.42	4.01	0.0452	0.0038	0.7997	0.50	0.00	48.47	28.00	1	4.00	4.00	70.81	21.64	46.22
NA_11	Shared	28.07	4.00	0.0453	0.0038	0.7968	1.00	0.00	75.22	54.75	0	4.00	4.00	65.91	7.13	36.52
NA_12	Shared	79.83	2.00	0.0190	0.0037	0.7825	0.57	0.00	129.17	107.35	0	3.00	3.00	0.63	1.88	1.25
NA_13	Shared	47.74	4.00	0.0403	0.0037	0.8014	1.00	0.00	113.13	43.56	0	3.50	4.00	32.47	16.76	24.61
NA_14	Sidewalk	71.40	4.03	0.0309	0.0038	0.8031	0.80	0.00	192.39	35.70	1	4.00	4.00	1.40	13.31	7.35
NA_15	Shared	38.45	2.00	0.0474	0.0037	0.8116	0.67	0.00	143.99	114.95	0	3.00	4.00	1.30	7.80	4.55
NA_16	Sidewalk	59.06	4.06	0.0019	0.0036	0.7745	0.50	0.00	158.85	129.82	1	4.00	5.00	3.39	3.39	3.39
NA_17	Shared	30.86	2.00	0.0287	0.0037	0.7922	0.20	0.20	145.53	35.12	0	3.00	4.00	1.62	1.62	0.81
NA_18	Shared	62.49	2.00	0.0266	0.0037	0.7793	0.25	0.00	98.86	81.80	0	3.00	4.00	1.60	2.40	2.00
NA_19	Shared	51.95	3.07	0.0263	0.0037	0.7691	0.67	0.00	46.26	133.73	0	3.00	4.00	15.40	2.89	9.14
NA_20	Sidewalk	56.33	2.60	0.0203	0.0037	0.7700	0.86	0.00	7.87	135.93	1	4.00	3.50	44.38	7.10	25.74
NA_21	Sidewalk	36.17	3.27	0.0360	0.0037	0.8175	0.75	0.00	109.97	18.09	1	4.00	4.00	4.15	9.68	6.91
NA_22	Sidewalk	105.08	3.15	0.0437	0.0037	0.8224	0.75	0.13	0.46	96.34	1	4.00	4.00	16.65	3.81	10.23
NA_23	Sidewalk	31.84	2.65	0.0347	0.0038	0.8012	0.50	0.00	68.00	132.41	1	4.00	4.00	9.42	3.14	6.28
NA_24	Sidewalk	36.01	2.65	0.0362	0.0038	0.8057	0.50	0.00	111.19	175.60	1	4.00	4.00	2.78	2.78	2.78
NA_25	Sidewalk	75.86	2.20	0.0387	0.0039	0.8191	0.43	0.14	177.13	67.29	1	4.00	4.00	1.32	1.32	1.32
NA_26	Sidewalk	77.73	2.20	0.0456	0.0039	0.8250	0.00	0.00	195.69	50.61	1	4.00	5.00	5.79	1.29	3.54
NA_27	Sidewalk	22.91	2.00	0.0474	0.0039	0.8171	0.00	0.00	197.90	112.40	1	4.00	5.00	4.36	4.36	4.36
NA_28	Sidewalk	41.13	2.00	0.0331	0.0039	0.8127	0.00	0.00	229.92	144.42	1	4.00	5.00	1.22	1.22	1.22
NA_29	Sidewalk	32.44	2.00	0.0389	0.0039	0.8213	0.00	0.00	266.70	154.15	1	4.00	5.00	1.54	1.54	1.54
NA_32	Shared	28.26	2.00	0.0471	0.0039	0.7992	0.80	0.20	301.60	156.61	0	3.50	3.00	1.77	1.77	1.77
NA_33	Shared	30.96	2.00	0.0185	0.0039	0.7965	0.00	0.00	312.96	163.67	0	4.00	3.50	1.61	1.61	1.61
NA_34	Shared	93.12	2.00	0.0199	0.0038	0.7719	0.00	0.40	371.21	225.71	0	3.00	4.00	1.61	1.07	1.34
NA_35	Sidewalk	50.04	2.10	0.0235	0.0037	0.7604	0.50	0.17	393.29	283.95	1	4.00	4.00	1.00	1.00	1.00
NA_36	Shared	69.82	2.00	0.0332	0.0038	0.7784	0.00	0.71	287.25	185.21	0	3.00	3.50	0.72	1.43	0.72
NA_37	Sidewalk	36.12	4.02	0.0559	0.0037	0.8061	0.50	0.00	270.40	168.36	1	4.00	5.00	8.31	5.54	6.92
NA_38	Sidewalk	71.26	2.35	0.0315	0.0036	0.7791	0.00	0.25	335.95	233.90	1	4.00	4.50	2.10	3.51	2.81
NA_39	Pedestrian Alley	56.94	4.68	0.0544	0.0038	0.8286	0.50	0.00	351.51	46.07	1	3.50	4.50	13.17	3.51	8.34
NA_40	Sidewalk	79.18	6.85	0.0306	0.0038	0.8198	0.67	0.00	283.37	55.83	1	4.00	5.00	7.58	5.05	6.31
NA_41	Sidewalk	81.88	2.78	0.0318	0.0039	0.8234	0.00	0.50	170.18	171.79	1	4.00	4.50	0.61	1.83	1.22
NA_42	Sidewalk	39.98	2.86	0.0302	0.0039	0.8079	0.33	0.50	125.15	169.48	1	4.00	3.50	1.25	2.50	1.25
NA_43	Pedestrian Alley	87.35	3.68	0.0363	0.0037	0.7773	0.50	0.00	85.57	138.19	1	4.00	5.00	9.16	6.30	7.73

ID	Path Type	Length (m)	Width (m)	Betweenness	Closeness	Straightness	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Mod. Con.	Path Obst.	PDR (am)	PDR (midday)	PDR (average)
NA_44	Sidewalk	84.59	4.15	0.0499	0.0037	0.7882	0.60	0.00	24.22	77.56	1	4.00	5.00	13.00	7.68	10.34
NA_45	Sidewalk	30.29	3.40	0.0127	0.0037	0.7755	0.00	0.00	40.20	49.87	1	4.00	5.00	6.60	1.65	4.13
NA_46	Sidewalk	29.69	4.04	0.0198	0.0037	0.7852	0.00	0.00	39.28	20.13	1	4.00	4.50	11.79	5.05	8.42
NA_47	Sidewalk	29.13	4.49	0.0268	0.0037	0.7908	0.00	0.00	7.35	26.49	1	4.00	4.50	6.87	42.91	24.89
NA_48	Sidewalk	30.45	4.49	0.0428	0.0037	0.7971	0.00	0.00	37.14	18.96	1	4.00	4.50	13.14	18.06	15.60
NA_49	Sidewalk	24.66	4.49	0.0582	0.0037	0.8111	1.00	0.00	64.70	16.06	1	4.00	4.50	77.05	32.44	54.74
NA_50	Sidewalk	57.73	3.64	0.0475	0.0039	0.8212	1.00	0.00	151.85	77.39	1	4.00	5.00	10.39	2.60	6.50
NA_51	Sidewalk	40.16	1.65	0.0198	0.0038	0.8025	0.57	0.14	302.82	201.80	1	3.00	3.00	1.25	1.25	0.62
NA_52	Sidewalk	40.66	1.65	0.0212	0.0038	0.8065	0.00	0.00	305.39	195.72	1	3.00	3.50	1.23	2.46	1.84
NA_53	Public Space	20.77	5.00	0.0219	0.0037	0.8011	0.00	0.00	281.64	178.69	1	5.00	5.00	9.63	9.63	9.63
NA_54	Sidewalk	123.70	2.01	0.0225	0.0038	0.8188	0.62	0.00	316.65	250.83	1	3.50	3.00	5.66	4.85	5.25
NA_55	Sidewalk	126.76	2.01	0.0224	0.0037	0.8207	0.71	0.00	324.94	257.97	1	4.00	4.00	5.13	5.13	5.13
NA_56	Public Space	102.09	3.50	0.0110	0.0037	0.7528	0.00	0.00	289.49	178.56	1	5.00	4.00	0.98	1.96	0.98
NA_57	Public Space	36.30	3.25	0.0156	0.0039	0.7848	0.00	0.00	237.65	151.85	1	5.00	5.00	1.38	15.15	7.58
NA_58	Sidewalk	41.46	4.66	0.0280	0.0038	0.8374	1.00	0.00	279.55	189.21	1	5.00	5.00	47.03	30.15	38.59
NA_59	Sidewalk	26.98	5.35	0.0272	0.0038	0.8376	1.00	0.00	238.88	148.54	1	4.50	4.50	29.65	20.39	25.02
NA_60	Sidewalk	20.04	5.35	0.0192	0.0039	0.8259	1.00	0.00	215.37	125.03	1	5.00	5.00	52.40	32.44	42.42
NA_61	Sidewalk	23.00	5.35	0.0269	0.0039	0.8304	1.00	0.00	193.85	103.51	1	4.50	4.50	41.30	39.13	40.22
NA_62	Sidewalk	65.99	2.50	0.0344	0.0039	0.8268	0.78	0.00	215.35	125.01	1	4.00	4.00	6.06	9.09	7.58
NA_63	Sidewalk	68.87	2.50	0.0411	0.0039	0.8226	0.78	0.00	208.30	117.96	1	4.00	4.00	3.63	19.60	11.62
NA_64	Shared	95.69	2.00	0.0247	0.0037	0.7334	0.33	0.11	167.18	140.16	0	3.00	4.00	7.84	6.27	7.05
NA_65	Sidewalk	65.22	1.58	0.0378	0.0037	0.7792	0.00	0.00	176.72	122.18	1	4.50	4.00	1.53	2.30	1.92
NA_66	Sidewalk	32.46	1.51	0.0352	0.0036	0.7516	0.00	0.00	127.88	85.32	1	4.00	4.00	1.54	6.16	3.85
NA_67	Shared	33.16	2.00	0.0065	0.0036	0.6978	0.00	0.00	161.94	119.38	0	3.00	4.00	0.15	1.51	0.75
NA_68	Shared	96.74	2.00	0.0222	0.0037	0.7354	0.55	0.00	134.71	115.65	0	4.00	4.00	10.85	12.92	11.89
NA_69	Shared	66.83	2.00	0.0307	0.0038	0.7845	0.25	0.00	115.47	41.70	0	3.50	3.50	2.24	1.50	1.87
NA_70	Sidewalk	33.73	4.84	0.0215	0.0039	0.7998	1.00	0.00	65.19	25.15	1	5.00	5.00	59.29	44.47	51.88
NA_71	Pedestrian	74.97	5.62	0.0528	0.0040	0.8328	0.80	0.00	95.31	52.62	1	4.00	4.00	2.67	17.34	10.00
NA_72	Sidewalk	33.28	3.50	0.0494	0.0040	0.8074	1.00	0.00	137.15	9.44	1	4.50	4.50	54.09	42.07	48.08
NA_73	Arcade	33.22	5.64	0.0382	0.0039	0.8086	1.00	0.00	121.62	80.05	1	5.00	5.00	30.10	115.89	73.00
NA_74	Pedestrian	87.30	5.20	0.0299	0.0039	0.8071	0.80	0.00	181.88	140.24	1	4.00	4.00	10.88	16.04	13.46
NA_75	Pedestrian	68.09	10.26	0.0533	0.0039	0.8357	1.00	0.00	236.67	124.53	1	5.00	5.00	17.62	66.09	41.86
NA_76	Public Space	27.08	10.00	0.0440	0.0039	0.8599	1.00	0.00	239.57	195.51	1	5.00	5.00	55.39	284.34	169.87
NA_77	Pedestrian	60.24	4.13	0.0362	0.0038	0.7831	1.00	0.00	169.15	131.85	1	4.00	4.00	3.32	19.09	11.21
NA_78	Pedestrian	26.12	4.08	0.0288	0.0038	0.7905	0.67	0.00	70.23	32.94	1	4.50	4.00	5.74	7.66	6.70
NA_79	Sidewalk	80.10	3.46	0.0438	0.0039	0.8222	1.00	0.00	5.43	36.14	1	4.00	4.50	6.24	33.71	19.98
NA_80	Arcade	29.62	5.42	0.0491	0.0039	0.8494	1.00	0.00	40.11	19.77	1	5.00	5.00	28.70	145.17	86.93
NA_81	Sidewalk	80.65	3.64	0.0341	0.0038	0.8241	1.00	0.00	78.86	40.33	1	4.00	4.00	15.50	30.38	22.94
NA_82	Sidewalk	30.58	3.50	0.0291	0.0037	0.8291	1.00	0.00	134.48	23.52	1	4.00	4.00	9.81	14.72	12.26
NA_83	Arcade	67.81	10.45	0.0388	0.0037	0.8425	1.00	0.00	254.12	112.58	1	5.00	5.00	79.63	92.91	86.27
NA_84	Pedestrian Alley	108.70	1.45	0.0207	0.0035	0.7809	0.00	0.00	214.17	155.23	1	2.50	2.50	0.23	0.92	0.46
NA_85	Arcade	39.39	7.51	0.0379	0.0037	0.8213	1.00	0.00	159.81	28.15	1	5.00	5.00	36.81	81.24	59.03
NA_86	Sidewalk	70.70	3.68	0.0271	0.0037	0.8166	0.71	0.00	175.47	35.35	1	4.00	4.50	5.66	25.46	15.56
NA_87	Sidewalk	40.77	4.04	0.0221	0.0036	0.8114	0.75	0.00	175.26	20.39	1	4.50	5.00	6.13	35.57	20.85
NA_88	Arcade	64.16	5.46	0.0340	0.0037	0.8303	1.00	0.00	144.66	39.36	1	5.00	5.00	36.63	91.18	63.90
NA_89	Arcade	48.83	7.08	0.0265	0.0038	0.8200	1.00	0.00	109.89	89.55	1	5.00	5.00	27.65	84.99	56.32

ID	Path Type	Length (m)	Width (m)	Betweenness	Closeness	Straightness	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Mod. Con.	Path Obst.	PDR (am)	PDR (midday)	PDR (average)
NA_90	Arcade	43.89	6.78	0.0310	0.0038	0.7927	1.00	0.00	107.42	73.72	1	5.00	5.00	17.09	78.61	47.85
NA_91	Arcade	36.61	6.76	0.0392	0.0038	0.7857	0.86	0.00	147.67	33.46	1	5.00	5.00	12.29	34.14	23.22
NA_92	Sidewalk	39.50	7.39	0.0315	0.0038	0.7866	0.80	0.00	55.17	24.54	1	5.00	5.00	6.33	26.58	16.46
NA_93	Sidewalk	37.66	5.69	0.0316	0.0037	0.7949	0.80	0.00	93.75	23.62	1	4.50	4.50	10.62	7.97	9.29
NA_94	Public Space	31.85	8.50	0.0370	0.0030	0.8271	0.00	0.00	26.94	65.42	1	5.00	5.00	81.63	69.07	75.35
NA_95	Sidewalk	24.91	6.14	0.0529	0.0038	0.8333	1.00	0.00	112.79	12.45	1	5.00	5.00	80.29	154.56	117.42
NA_96	Sidewalk	21.45	5.71	0.0524	0.0038	0.8316	1.00	0.00	89.61	10.72	1	5.00	5.00	34.97	97.90	66.43
NA_97	Sidewalk	20.34	5.42	0.0535	0.0038	0.8333	1.00	0.00	36.54	23.97	1	5.00	5.00	130.29	115.54	122.91
NA_98	Sidewalk	41.64	5.36	0.0533	0.0039	0.8507	1.00	0.00	47.20	44.77	1	4.50	5.00	27.62	64.84	46.23
NA_99	Sidewalk	52.58	3.51	0.0343	0.0038	0.8426	1.00	0.00	87.96	29.88	1	4.50	4.50	24.72	45.64	35.18
NA_100	Sidewalk	54.57	2.90	0.0326	0.0037	0.8172	1.00	0.00	96.32	83.46	1	4.50	4.50	14.66	26.57	20.62
NA_101	Shared	79.35	2.00	0.0204	0.0037	0.7980	0.33	0.50	174.93	176.18	0	3.00	3.00	0.63	1.26	0.95
NA_102	Sidewalk	77.39	2.85	0.0359	0.0037	0.8174	0.83	0.00	131.30	262.85	1	4.00	4.50	10.98	32.95	21.97
NA_103	Shared	43.31	2.00	0.0401	0.0037	0.8141	0.22	0.33	183.89	197.78	0	3.00	4.00	3.46	4.62	4.04
NA_105	Sidewalk	40.46	3.83	0.0306	0.0037	0.8116	0.50	0.00	167.72	135.65	1	4.50	5.00	8.65	4.94	6.80

Osaka – Tsuruhashi

ID	Path Type	Length (m)	Width (m)	Betweenness	Closeness	Straightness	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Mod. Con.	Path Obst.	PDR (am)	PDR (midday)	PDR (average)
TS_1	Sidewalk	20.34	2.50	0.0328	0.0039	0.7980	0.67	0.00	120.19	10.17	1	4.00	4.00	7.37	4.92	6.15
TS_2	Sidewalk	20.09	2.51	0.0482	0.0039	0.8155	0.67	0.33	99.97	10.05	1	4.00	4.00	7.47	4.98	6.22
TS_3	Sidewalk	29.71	2.63	0.0481	0.0040	0.8211	1.00	0.00	109.62	27.86	1	4.50	5.00	28.61	11.78	20.20
TS_4	Sidewalk	29.08	4.55	0.0317	0.0040	0.8292	1.00	0.00	16.84	14.54	1	4.50	5.00	27.51	17.19	22.35
TS_5	Shared	30.37	2.00	0.0213	0.0037	0.7754	0.00	0.50	94.08	98.14	0	3.00	4.00	1.65	3.29	2.47
TS_6	Shared	23.67	2.00	0.0317	0.0037	0.7805	0.00	1.00	67.06	71.12	0	3.00	4.00	2.11	2.11	2.11
TS_7	Sidewalk	65.62	2.53	0.0306	0.0037	0.7796	0.50	0.00	22.41	92.09	1	4.00	4.00	1.52	1.52	1.52
TS_8	Sidewalk	47.85	2.65	0.0307	0.0037	0.7924	0.40	0.00	34.32	148.82	1	4.00	4.00	8.36	6.27	7.31
TS_9	Pedestrian Alley	41.33	1.50	0.0166	0.0037	0.7091	0.00	1.00	172.96	130.11	0	3.00	3.00	0.12	0.12	0.06
TS_10	Shared	63.87	2.00	0.0341	0.0039	0.7581	0.32	0.42	129.49	96.37	0	3.00	4.00	1.57	3.13	2.35
TS_11	Sidewalk	94.07	2.44	0.0422	0.0040	0.8148	0.60	0.13	68.93	69.79	1	4.00	4.00	2.13	2.66	2.39
TS_12	Shared	81.87	2.00	0.0405	0.0039	0.8122	0.53	0.29	96.44	95.59	0	4.00	4.00	3.66	7.33	5.50
TS_13	Shared	33.02	2.00	0.0316	0.0038	0.7988	0.13	0.38	153.89	153.03	0	4.00	4.00	9.09	3.03	6.06
TS_14	Shared	66.2	2.00	0.0301	0.0037	0.7892	0.00	1.00	203.50	202.64	0	3.00	4.00	0.00	1.51	0.76
TS_15	Arcade	44.97	2.27	0.0377	0.0041	0.8028	0.60	0.00	128.84	83.83	0	4.00	4.00	2.22	2.22	1.67
TS_16	Sidewalk	44.12	3.03	0.0468	0.0041	0.8244	1.00	0.00	43.66	91.27	1	5.00	5.00	12.47	29.47	19.83
TS_17	Arcade	45.52	2.27	0.0312	0.0041	0.8007	0.94	0.00	65.84	43.27	1	5.00	5.00	2.20	19.77	10.98
TS_18	Arcade	50.65	2.55	0.0488	0.0041	0.8186	1.00	0.00	97.20	56.00	1	5.00	5.00	21.72	50.35	36.03
TS_19	Arcade	47.78	1.73	0.0497	0.0041	0.8116	1.00	0.00	145.18	110.00	1	5.00	5.00	17.79	55.46	36.63
TS_20	Sidewalk	47.7	2.01	0.0353	0.0039	0.7968	0.83	0.00	157.24	110.30	1	4.00	3.00	8.39	13.63	11.01
TS_21	Shared	20.22	2.00	0.0276	0.0037	0.7727	0.00	1.00	199.22	189.02	0	3.00	3.00	0.00	2.47	1.24
TS_22	Shared	25.91	2.00	0.0264	0.0037	0.7717	0.00	1.00	222.28	165.95	0	3.00	3.00	1.93	1.93	1.93
TS_23	Shared	45.26	2.00	0.0307	0.0040	0.7877	0.25	0.50	204.06	84.76	0	3.00	4.00	2.21	13.26	7.73
TS_24	Shared	36.22	2.00	0.0365	0.0039	0.7905	0.00	0.82	248.54	144.28	0	3.00	4.00	4.14	2.76	3.45
TS_25	Shared	45.59	2.00	0.0387	0.0037	0.8073	0.09	0.64	279.05	243.73	0	4.00	4.00	2.19	3.29	2.74
TS_26	Sidewalk	72.01	2.03	0.0307	0.0036	0.7870	0.20	0.30	273.77	194.30	1	4.00	3.50	9.72	5.55	7.64
TS_27	Shared	124.51	2.00	0.0278	0.0037	0.8156	0.67	0.08	211.57	128.00	0	3.00	4.00	8.83	7.23	8.03
TS_28	Public Space	39.01	8.00	0.0170	0.0035	0.8092	0.00	0.00	224.83	215.81	1	5.00	5.00	1.28	1.28	0.64
TS_29	Shared	69.32	2.00	0.0263	0.0037	0.8219	0.42	0.25	120.39	134.90	0	3.00	4.00	7.21	10.82	9.02
TS_30	Pedestrian Alley	28.94	2.05	0.0246	0.0040	0.8157	1.00	0.00	60.37	68.20	1	5.00	5.00	12.09	5.18	8.64
TS_31	Pedestrian Alley	21.42	1.50	0.0245	0.0040	0.8014	0.75	0.00	85.55	54.26	1	4.00	3.00	2.33	2.33	1.17
TS_32	Pedestrian Alley	21.3	2.05	0.0243	0.0040	0.7986	0.78	0.00	108.06	60.63	1	5.00	4.00	7.04	2.35	4.69
TS_33	Pedestrian Alley	22.58	2.00	0.0277	0.0040	0.8259	1.00	0.00	86.12	61.27	1	5.00	5.00	31.00	50.93	40.97
TS_34	Pedestrian Alley	21.5	2.54	0.0285	0.0040	0.8255	1.00	0.00	108.16	39.23	1	5.00	5.00	32.56	53.49	43.02
TS_35	Sidewalk	116.66	2.45	0.0326	0.0037	0.8200	0.44	0.33	51.16	129.13	1	4.00	4.00	7.29	12.43	9.86
TS_36	Sidewalk	39.16	2.45	0.0443	0.0036	0.8311	0.67	0.00	144.14	205.43	1	4.00	4.00	6.38	15.32	10.85
TS_37	Shared	81.50	2.00	0.0363	0.0035	0.8301	0.05	0.85	165.31	265.75	0	3.00	3.50	2.45	1.84	2.15
TS_38	Shared	87.77	2.00	0.0214	0.0035	0.8002	0.00	1.00	144.53	292.81	0	3.00	4.00	0.57	0.57	0.29
TS_39	Sidewalk	59.98	2.55	0.0283	0.0034	0.8121	0.50	0.00	174.84	199.95	1	4.00	5.00	10.00	1.67	5.84
TS_40	Shared	33.89	2.00	0.0288	0.0034	0.8088	0.00	0.50	170.58	195.67	0	3.00	4.00	4.43	4.43	4.43
TS_41	Sidewalk	59.6	2.33	0.0233	0.0034	0.8011	0.20	0.40	230.31	255.40	1	5.00	5.00	5.87	5.03	5.45
TS_42	Sidewalk	109.31	2.03	0.0213	0.0034	0.7910	0.00	0.33	198.52	196.21	1	5.00	5.00	6.40	1.37	3.89
TS_43	Shared	49.63	2.00	0.0273	0.0034	0.7878	0.00	0.40	206.88	204.58	0	3.00	4.00	2.01	4.03	3.02
TS_44	Shared	67.31	2.00	0.0355	0.0036	0.8279	0.40	0.20	110.21	107.90	0	3.00	4.00	18.57	2.23	10.40

ID	Path Type	Length (m)	Width (m)	Betweenness	Closeness	Straightness	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Mod. Con.	Path Obst.	PDR (am)	PDR (midday)	PDR (average)
TS_45	Sidewalk	37.85	5.03	0.0400	0.0037	0.8345	0.60	0.00	127.66	101.29	1	5.00	5.00	36.99	5.28	21.14
TS_46	Sidewalk	82.69	2.04	0.0406	0.0037	0.8222	0.17	0.50	150.08	147.77	1	5.00	4.50	7.26	1.81	4.54
TS_47	Shared	44.13	2.00	0.0501	0.0037	0.8275	0.29	0.14	223.06	220.76	0	3.00	4.00	18.13	4.53	11.33
TS_48	Sidewalk	77.28	5.05	0.0321	0.0037	0.8393	0.50	0.17	161.50	159.20	1	5.00	4.00	13.59	3.23	8.41
TS_49	Sidewalk	82.49	2.00	0.0311	0.0038	0.7973	0.00	0.70	218.57	228.68	1	3.00	3.50	0.61	3.64	2.12
TS_50	Sidewalk	28.92	1.78	0.0352	0.0039	0.8024	0.00	1.00	183.70	284.39	1	3.00	3.50	0.00	3.46	1.73
TS_51	Shared	48.36	2.00	0.0517	0.0040	0.8280	0.00	0.33	197.94	322.45	0	3.00	4.00	2.07	2.07	2.07
TS_52	Shared	74.14	2.00	0.0547	0.0040	0.8306	0.00	0.69	205.43	344.86	0	3.00	3.50	2.02	0.67	1.35
TS_53	Sidewalk	43.04	1.64	0.0294	0.0039	0.8006	0.00	0.75	169.37	323.86	1	4.00	4.00	0.58	0.58	0.29
TS_54	Shared	30.41	2.00	0.0367	0.0038	0.8008	0.25	0.50	99.65	249.36	0	3.00	4.00	3.29	3.29	3.29
TS_55	Shared	75.83	2.00	0.0379	0.0038	0.8099	0.22	0.22	46.53	214.40	0	3.00	4.00	1.32	3.96	1.98
TS_56	Sidewalk	102.71	3.16	0.0242	0.0037	0.8266	0.50	0.17	122.15	307.25	1	4.00	4.00	2.43	1.95	2.19
TS_57	Pedestrian Alley	58.78	1.50	0.0380	0.0037	0.7824	0.00	1.00	55.67	234.84	0	4.00	2.50	0.85	0.85	0.43
TS_58	Shared	42.96	2.00	0.0383	0.0037	0.8081	0.56	0.00	156.82	171.33	0	3.00	3.50	1.16	6.98	4.07
TS_59	Shared	45.74	2.00	0.0361	0.0036	0.8188	0.00	0.57	171.99	291.36	0	3.00	4.00	3.28	1.09	2.19
TS_60	Shared	49.79	2.00	0.0269	0.0036	0.8215	0.17	0.17	219.75	293.38	0	3.00	4.00	3.01	3.01	3.01
TS_61	Sidewalk	53.15	1.85	0.0241	0.0036	0.8261	0.00	0.33	237.38	289.39	1	4.00	4.00	1.88	0.00	0.94
TS_62	Shared	46.11	2.00	0.0278	0.0036	0.8198	0.00	0.57	269.65	302.75	0	3.00	4.00	2.17	1.08	1.63
TS_63	Sidewalk	45.46	2.01	0.0288	0.0036	0.8295	0.14	0.86	249.75	336.66	1	3.50	3.50	1.10	1.10	1.10
TS_64	Sidewalk	45.39	1.50	0.0304	0.0036	0.8021	0.00	1.00	249.71	336.62	1	3.50	4.00	2.20	0.00	1.10
TS_65	Shared	113.87	2.00	0.0269	0.0036	0.8037	0.00	0.97	268.79	272.93	0	3.00	3.50	1.32	0.00	0.66
TS_66	Shared	66.33	2.00	0.0303	0.0035	0.8070	0.00	0.96	240.68	327.59	0	3.00	4.00	1.51	1.51	1.51
TS_67	Shared	32.22	2.00	0.0345	0.0036	0.8010	0.43	0.43	122.89	209.80	0	4.00	4.00	7.76	4.66	6.21
TS_68	Shared	26.05	2.00	0.0357	0.0036	0.8076	0.42	0.25	152.02	238.93	0	4.00	4.00	3.84	3.84	3.84
TS_69	Sidewalk	28.89	2.55	0.0358	0.0038	0.8228	0.86	0.00	80.70	168.43	1	4.50	5.00	12.11	5.19	8.65
TS_70	Shared	35.51	2.00	0.0126	0.0035	0.7362	0.13	0.38	198.58	286.30	0	3.00	4.00	1.41	2.82	2.11
TS_71	Shared	39.36	2.00	0.0252	0.0037	0.7940	0.57	0.00	54.65	186.87	0	3.00	4.00	5.08	1.27	3.18
TS_72	Shared	27.21	2.00	0.0257	0.0038	0.7939	0.50	0.00	48.58	153.59	0	3.00	4.00	3.68	1.84	2.76
TS_73	Arcade	38.05	3.03	0.0278	0.0040	0.7976	1.00	0.00	128.50	56.53	1	5.00	5.00	17.08	27.60	22.34
TS_74	Arcade	28.96	3.42	0.0469	0.0040	0.8138	1.00	0.00	144.83	80.79	1	5.00	5.00	17.27	18.99	18.13
TS_75	Arcade	22.61	4.21	0.0610	0.0039	0.8281	1.00	0.00	119.04	104.33	1	5.00	5.00	72.98	117.20	95.09
TS_76	Arcade	18.54	4.13	0.0599	0.0039	0.8273	1.00	0.00	105.61	136.29	1	5.00	5.00	26.97	113.27	70.12
TS_77	Pedestrian Alley	48.93	1.50	0.0426	0.0039	0.7915	0.00	1.00	148.08	151.10	0	3.00	3.00	1.02	1.02	0.51
TS_78	Shared	64.87	2.00	0.0384	0.0038	0.8021	0.50	0.42	113.00	228.46	0	3.50	4.00	1.54	11.56	6.55
TS_79	Shared	42.03	2.00	0.0321	0.0037	0.7944	0.09	0.27	39.53	252.51	0	3.00	3.00	4.76	5.95	5.35
TS_80	Arcade	72.12	3.56	0.0531	0.0038	0.8249	0.88	0.00	182.17	270.23	1	4.50	5.00	11.79	18.03	14.91
TS_81	Shared	25.75	2.00	0.0313	0.0037	0.7855	0.00	1.00	276.72	275.36	0	4.00	4.00	0.19	1.94	0.97
TS_82	Shared	67.29	2.00	0.0296	0.0037	0.7657	0.00	1.00	297.49	296.13	0	4.00	4.00	0.07	1.49	0.74
TS_83	Shared	31.98	2.00	0.0264	0.0036	0.7690	0.00	1.00	347.13	286.62	0	4.00	4.00	0.16	0.02	0.01
TS_84	Shared	52.88	2.00	0.0246	0.0036	0.7896	0.00	0.92	274.57	412.64	0	3.00	4.00	0.95	0.95	0.95
TS_85	Sidewalk	47.67	4.30	0.0443	0.0037	0.8447	0.40	0.00	325.01	450.57	1	4.00	4.00	1.05	6.29	3.67
TS_86	Shared	115.46	2.00	0.0247	0.0036	0.8134	0.00	0.95	392.03	392.79	0	3.00	4.00	0.43	0.87	0.65
TS_87	Pedestrian Alley	25.74	1.50	0.0241	0.0036	0.7953	0.00	1.00	314.27	408.91	0	3.00	3.00	0.19	0.19	0.10
TS_88	Pedestrian Alley	24.92	1.50	0.0182	0.0036	0.7756	0.00	1.00	288.94	434.24	0	3.00	3.00	0.20	0.20	0.10
TS_89	Sidewalk	47.83	4.30	0.0480	0.0036	0.8332	0.50	0.00	223.25	433.93	1	4.50	4.00	2.09	5.23	3.66
TS_90	Shared	138.61	2.00	0.0256	0.0035	0.8225	0.16	0.58	240.18	343.31	0	3.00	4.00	0.72	1.44	1.08

ID	Path Type	Length (m)	Width (m)	Betweenness	Closeness	Straightness	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Mod. Con.	Path Obst.	PDR (am)	PDR (midday)	PDR (average)
TS_91	Shared	93.96	2.00	0.0188	0.0034	0.8054	0.00	0.96	123.91	319.62	0	3.50	4.00	1.06	0.00	0.53
TS_92	Sidewalk	103.66	2.26	0.0310	0.0035	0.8404	0.36	0.00	1.10	372.10	1	4.00	4.00	1.93	1.45	1.69
TS_93	Sidewalk	128.92	2.35	0.0465	0.0036	0.8432	0.67	0.00	25.86	343.60	1	4.00	4.00	3.10	6.21	4.65
TS_94	Sidewalk	109.18	2.41	0.0249	0.0035	0.8167	0.67	0.00	93.19	224.55	1	4.00	4.00	4.58	5.50	5.04
TS_95	Pedestrian Alley	24.72	1.50	0.0338	0.0040	0.8056	0.00	1.00	101.40	60.71	1	4.00	3.00	2.02	2.02	1.01
TS_96	Shared	22.78	2.00	0.0310	0.0037	0.8011	0.13	0.63	181.79	180.93	0	4.00	4.00	2.19	1.10	1.65
TS_97	Shared	44.22	2.00	0.0183	0.0036	0.8032	0.20	0.40	177.16	191.67	0	3.00	4.00	2.26	5.65	3.96
TS_98	Sidewalk	57.66	5.23	0.0385	0.0038	0.8196	0.86	0.00	87.98	53.53	1	5.00	5.00	31.22	13.87	22.55
TS_99	Shared	38.14	2.00	0.0278	0.0036	0.8101	0.43	0.14	154.41	211.88	0	3.00	4.00	1.31	7.87	4.59
TS_100	Shared	63.65	2.00	0.0301	0.0036	0.8063	0.09	0.55	309.29	357.63	0	3.00	4.00	2.36	1.57	1.96

Osaka – Tanimachi-Yonchome

ID	Path Type	Length (m)	Width (m)	Betweenness	Closeness	Straightness	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Mod. Con.	Path Obst.	PDR (am)	PDR (midday)	PDR (average)
TY_1	Sidewalk	41.52	4.52	0.0343	0.0039	0.8286	1.00	0.00	448.79	62.09	1	4.00	5.00	3.61	4.82	4.21
TY_2	Sidewalk	96.05	4.95	0.0514	0.0039	0.8290	0.00	0.25	495.12	54.32	1	4.00	4.00	6.77	6.77	6.77
TY_3	Shared	128.01	2.00	0.0328	0.0038	0.8265	0.31	0.00	533.55	146.86	0	3.00	4.00	1.17	3.52	2.34
TY_4	Sidewalk	53.69	4.41	0.0353	0.0038	0.8171	0.71	0.00	496.39	97.44	1	4.00	4.00	5.59	1.86	3.73
TY_5	Shared	128.81	2.00	0.0291	0.0036	0.8183	0.17	0.08	564.51	135.01	0	3.00	4.00	1.16	1.16	0.58
TY_6	Sidewalk	61.57	2.39	0.0201	0.0036	0.8254	0.71	0.00	616.75	157.53	1	4.00	4.00	5.68	8.12	6.90
TY_7	Sidewalk	121.28	2.82	0.0530	0.0037	0.8381	0.69	0.08	542.88	65.67	1	4.00	5.00	6.18	13.60	9.89
TY_8	Sidewalk	50.59	4.71	0.0593	0.0037	0.8203	0.86	0.00	501.09	46.11	1	4.00	5.00	19.77	34.59	27.18
TY_9	Shared	129.75	2.00	0.0369	0.0037	0.8125	0.30	0.15	591.26	136.28	0	3.00	4.00	5.01	5.78	5.39
TY_10	Sidewalk	129.14	3.02	0.0337	0.0037	0.8302	0.17	0.17	639.15	184.17	1	4.00	4.00	1.94	2.71	2.32
TY_11	Sidewalk	35.95	4.68	0.0384	0.0036	0.8334	1.00	0.00	603.14	148.15	1	4.00	5.00	5.56	20.86	13.21
TY_12	Sidewalk	100.9	1.27	0.0280	0.0038	0.8283	0.00	0.57	586.10	273.69	1	4.00	3.00	0.50	0.50	0.50
TY_13	Sidewalk	26.81	1.31	0.0301	0.0040	0.8313	0.00	0.67	649.96	336.61	1	4.00	3.00	0.93	0.93	0.47
TY_14	Sidewalk	47.88	2.39	0.0460	0.0041	0.8526	0.60	0.00	686.02	325.41	1	4.50	4.50	1.04	3.13	1.57
TY_15	Sidewalk	94.55	2.74	0.0274	0.0042	0.8482	0.43	0.14	770.22	308.84	1	4.00	5.00	2.12	4.76	3.44
TY_16	Sidewalk	49.88	2.16	0.0386	0.0039	0.8293	0.60	0.20	690.20	225.99	1	3.50	3.00	9.02	1.00	5.01
TY_17	Sidewalk	65.54	2.30	0.0318	0.0037	0.8277	0.25	0.25	645.59	168.38	1	3.50	4.00	1.53	0.76	1.14
TY_18	Sidewalk	92.35	2.58	0.0303	0.0037	0.8465	0.60	0.20	658.99	181.78	1	4.50	5.00	4.87	3.79	4.33
TY_19	Sidewalk	52.82	3.01	0.0438	0.0041	0.8445	0.00	0.00	797.67	332.59	1	4.50	5.00	4.73	0.95	2.84
TY_20	Sidewalk	66.14	3.01	0.0226	0.0039	0.8503	0.33	0.17	751.29	274.08	1	4.00	4.00	3.02	2.27	2.65
TY_21	Sidewalk	126.71	2.15	0.0326	0.0038	0.8465	0.44	0.00	763.91	304.68	1	4.00	4.50	8.29	3.95	6.12
TY_22	Shared	124.81	2.00	0.0220	0.0035	0.8268	0.11	0.22	808.05	364.03	0	3.00	4.00	3.20	0.80	2.00
TY_23	Shared	124.01	2.00	0.0180	0.0035	0.8224	0.14	0.32	763.06	322.26	0	3.00	4.00	6.05	3.63	4.84
TY_24	Sidewalk	60.6	2.95	0.0275	0.0037	0.8489	0.50	0.00	718.02	258.79	1	4.00	5.00	6.60	4.95	5.78
TY_25	Sidewalk	30.13	3.00	0.0286	0.0035	0.8464	0.67	0.00	673.39	232.59	1	4.00	4.50	14.94	6.64	10.79
TY_26	Sidewalk	77.85	7.55	0.0532	0.0037	0.8404	0.43	0.00	591.70	150.90	1	5.00	5.00	8.35	10.92	9.63
TY_27	Sidewalk	46.34	3.78	0.0396	0.0038	0.8387	0.00	0.00	575.95	135.15	1	4.00	4.00	3.24	2.16	2.70
TY_28	Sidewalk	123.12	5.69	0.0304	0.0036	0.8284	0.40	0.00	789.30	285.35	1	4.50	4.00	10.15	7.72	8.93
TY_29	Sidewalk	83.04	3.21	0.0410	0.0037	0.8444	0.29	0.14	694.47	253.00	1	4.00	5.00	13.25	31.31	22.28
TY_30	Sidewalk	79.28	2.89	0.0381	0.0038	0.8374	0.00	0.00	607.56	341.35	1	5.00	5.00	30.90	33.43	32.16
TY_31	Sidewalk	104.01	2.00	0.0304	0.0038	0.8183	0.00	0.50	515.92	331.77	1	3.00	4.00	1.44	0.48	0.96
TY_32	Sidewalk	78.88	2.24	0.0449	0.0039	0.8205	0.00	0.00	502.71	231.72	1	4.00	4.00	7.61	1.90	4.75
TY_33	Sidewalk	83.64	2.48	0.0638	0.0040	0.8363	0.25	0.00	590.47	143.95	1	4.00	5.00	10.76	5.98	8.37
TY_34	Sidewalk	98.69	5.01	0.0767	0.0041	0.8286	0.67	0.00	556.73	52.78	1	5.00	4.00	50.16	18.24	34.20
TY_35	Sidewalk	68.55	4.71	0.0778	0.0040	0.8058	0.60	0.00	527.60	73.39	1	4.00	4.00	20.42	10.21	15.32
TY_36	Shared	50.14	2.00	0.0739	0.0040	0.8104	0.20	0.60	571.05	164.07	0	3.50	4.00	2.99	4.99	3.99
TY_37	Public Space	35.61	5.00	0.0404	0.0040	0.7545	0.00	0.00	575.66	123.04	1	5.00	5.00	2.81	5.62	4.21
TY_38	Public Space	38.92	7.00	0.0308	0.0038	0.7680	0.00	0.00	506.29	159.44	1	5.00	5.00	19.27	2.57	10.92
TY_39	Shared	71.31	2.00	0.0323	0.0037	0.7833	0.00	0.36	496.08	248.72	0	3.00	4.00	2.80	1.40	2.10
TY_40	Shared	36.16	2.00	0.0293	0.0037	0.7631	0.00	0.40	495.68	231.15	0	3.00	4.00	0.69	0.69	0.35
TY_41	Shared	23.9	2.00	0.0402	0.0038	0.7860	0.25	0.25	465.65	208.73	0	3.00	4.00	1.05	1.05	0.52
TY_42	Shared	49.19	2.00	0.0319	0.0037	0.7099	0.00	0.50	491.90	161.43	0	2.50	4.00	0.51	0.51	0.25
TY_43	Sidewalk	78.01	4.76	0.0616	0.0038	0.8229	0.33	0.00	414.69	235.79	1	4.00	5.00	7.69	3.20	5.45
TY_44	Shared	71.04	2.00	0.0137	0.0037	0.7101	0.00	0.93	431.79	203.42	0	3.00	4.00	0.35	0.35	0.18

ID	Path Type	Length (m)	Width (m)	Betweenness	Closeness	Straightness	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Mod. Con.	Path Obst.	PDR (am)	PDR (midday)	PDR (average)
TY_45	Sidewalk	31.04	2.29	0.0653	0.0037	0.7610	0.50	0.50	397.36	232.69	1	4.00	4.00	1.61	3.22	2.42
TY_46	Sidewalk	33.92	2.21	0.0586	0.0037	0.7559	0.33	0.00	429.84	200.21	1	4.00	4.00	1.47	1.47	1.47
TY_47	Shared	40.57	2.00	0.0138	0.0037	0.7121	0.00	0.92	457.87	152.53	0	3.00	4.00	1.23	1.23	1.85
TY_48	Sidewalk	73.28	5.06	0.0464	0.0039	0.7654	0.67	0.00	487.63	63.91	1	4.00	5.00	37.53	10.23	23.88
TY_49	Sidewalk	59.96	2.69	0.0349	0.0037	0.8061	0.00	0.00	376.93	60.73	1	4.00	5.00	7.51	1.67	4.59
TY_50	Shared	56.44	2.00	0.0283	0.0036	0.7306	0.00	0.00	434.05	109.55	0	3.00	4.00	0.89	0.89	0.89
TY_51	Sidewalk	55.97	2.22	0.0344	0.0035	0.7871	0.00	1.00	363.98	129.65	1	4.00	4.00	4.47	0.89	2.68
TY_52	Shared	50.58	2.00	0.0421	0.0038	0.7689	0.00	0.50	432.19	56.04	0	3.00	4.00	1.98	1.98	1.98
TY_53	Sidewalk	178.39	4.37	0.0347	0.0037	0.8136	0.00	0.00	246.80	95.50	1	4.00	5.00	5.89	6.73	6.31
TY_54	Sidewalk	151.63	2.99	0.1184	0.0043	0.8281	0.00	0.00	47.84	177.08	1	4.00	5.00	3.63	5.61	4.62
TY_55	Sidewalk	70.18	3.71	0.0514	0.0042	0.8189	0.00	0.00	78.37	181.85	1	5.00	5.00	13.54	9.26	11.40
TY_56	Sidewalk	38.17	3.77	0.0395	0.0042	0.7964	0.00	0.00	24.20	128.16	1	5.00	5.00	5.24	26.20	15.72
TY_57	Sidewalk	44.28	3.52	0.0620	0.0042	0.8127	0.00	0.00	17.03	99.08	1	4.50	5.00	2.26	4.52	3.39
TY_58	Sidewalk	69.47	4.32	0.0606	0.0039	0.8194	0.00	0.00	73.90	42.20	1	4.00	5.00	4.32	5.76	5.04
TY_59	Public Space	58.86	10.00	0.0323	0.0039	0.8249	0.60	0.00	60.51	48.80	1	5.00	5.00	11.04	50.12	30.58
TY_60	Sidewalk	213.61	5.01	0.0281	0.0037	0.8042	0.33	0.00	236.79	112.38	1	4.00	5.00	8.66	15.92	12.29
TY_61	Sidewalk	139.6	4.93	0.0257	0.0038	0.8157	0.90	0.00	453.58	96.46	1	4.00	5.00	4.66	20.77	12.71
TY_62	Sidewalk	212.91	3.33	0.0331	0.0037	0.8057	0.50	0.00	289.74	109.90	1	4.50	5.00	10.10	20.67	15.38
TY_63	Sidewalk	101.58	3.16	0.0185	0.0038	0.8065	0.00	0.00	132.50	264.54	1	5.00	5.00	6.40	12.80	9.60
TY_64	Sidewalk	136.76	5.21	0.0237	0.0041	0.8431	0.00	0.00	188.65	320.69	1	4.00	5.00	4.39	6.95	5.67
TY_65	Sidewalk	169.11	4.12	0.0351	0.0037	0.8448	0.00	0.00	262.55	399.53	1	4.00	4.50	5.03	4.43	4.73
TY_66	Sidewalk	106.48	3.05	0.0512	0.0036	0.8355	0.75	0.00	406.66	248.45	1	5.00	5.00	11.27	19.72	15.50
TY_67	Sidewalk	69.08	2.05	0.0274	0.0035	0.8267	0.75	0.25	414.89	241.57	1	5.00	5.00	2.17	9.41	5.79
TY_68	Sidewalk	177.58	5.71	0.0583	0.0036	0.8139	0.94	0.00	547.68	106.42	1	4.00	5.00	41.67	35.76	38.71
TY_69	Sidewalk	23.47	5.63	0.0601	0.0038	0.8093	1.00	0.00	495.90	29.37	1	5.00	5.00	25.56	21.30	23.43
TY_70	Sidewalk	42.87	5.75	0.0842	0.0038	0.8065	1.00	0.00	462.73	51.40	1	4.00	4.00	38.49	44.32	41.40
TY_71	Sidewalk	87.16	2.23	0.0295	0.0035	0.8040	0.60	0.00	371.53	54.48	1	4.50	5.00	9.75	8.60	9.18
TY_72	Sidewalk	90.93	2.15	0.0294	0.0034	0.7881	0.00	0.00	282.49	143.52	1	4.50	5.00	3.85	3.85	3.85
TY_73	Sidewalk	135.21	2.23	0.0212	0.0038	0.8314	0.00	0.00	169.42	256.60	1	4.00	5.00	2.96	8.88	5.92
TY_74	Public Space	31.92	7.00	0.0615	0.0038	0.8054	0.83	0.00	498.48	14.22	1	5.00	5.00	26.63	37.59	32.11
TY_75	Sidewalk	84.01	2.52	0.0471	0.0040	0.8361	0.40	0.00	591.34	152.90	1	4.00	4.00	4.17	2.98	3.57

Appendix L: Taipei Datasets

Taipei – Songjiang-Nanjing

ID	Path Type	Length (m)	Width (m)	Betweenness	Closeness	Straightness	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Mod. Con.	Path Obst.	PDR (am)	PDR (midday)	PDR (average)
SN_1	Sidewalk	96.59	5.51	0.0514	0.0037	0.8117	0.78	0.11	64.23	285.80	1	4.00	5.00	3.62	21.22	12.42
SN_2	Shared	38.97	2.00	0.0373	0.0038	0.7690	0.00	1.00	91.44	310.84	0	4.00	4.00	2.57	2.57	2.57
SN_3	Shared	122.25	2.00	0.0301	0.0038	0.7931	0.11	0.67	171.03	188.37	0	4.00	4.00	2.45	6.54	3.27
SN_4	Sidewalk	42.60	2.08	0.0451	0.0039	0.8176	0.86	0.00	253.42	148.54	1	4.50	5.00	2.35	9.39	5.87
SN_5	Path	37.78	1.50	0.0247	0.0038	0.7610	0.00	1.00	107.77	294.85	1	5.00	3.00	1.32	2.65	1.99
SN_6	Sidewalk	57.39	1.85	0.0249	0.0040	0.8017	0.00	0.50	57.32	390.27	1	3.00	4.00	3.49	5.23	3.05
SN_7	Sidewalk	28.82	1.85	0.0369	0.0040	0.7992	0.00	1.00	100.43	347.17	1	3.00	4.00	3.47	3.47	2.60
SN_8	Sidewalk	48.60	1.85	0.0488	0.0040	0.8188	0.00	0.50	139.14	308.46	1	5.00	4.00	3.09	4.12	2.57
SN_9	Sidewalk	40.09	4.16	0.0288	0.0040	0.8200	0.50	0.50	170.21	261.75	1	5.00	5.00	1.25	2.49	1.25
SN_10	Public Space	30.29	20.00	0.0632	0.0041	0.8528	0.50	0.00	197.23	240.94	1	5.00	5.00	29.71	42.92	36.32
SN_11	Sidewalk	62.48	8.65	0.0497	0.0040	0.8240	0.71	0.00	139.85	31.24	1	3.50	4.50	13.60	22.41	18.01
SN_12	Sidewalk	32.87	8.25	0.0170	0.0036	0.7561	0.75	0.00	92.18	16.44	1	4.00	4.00	4.56	10.65	7.61
SN_13	Shared	50.37	2.00	0.0124	0.0036	0.7309	0.33	0.00	100.93	58.06	0	4.00	4.00	1.99	2.98	2.48
SN_14	Shared	95.03	2.00	0.0308	0.0039	0.7751	0.56	0.31	220.25	163.26	0	3.50	4.00	4.74	6.31	5.52
SN_15	Shared	78.08	2.00	0.0278	0.0039	0.7903	0.30	0.40	220.89	193.83	0	4.00	4.00	1.28	7.68	4.48
SN_16	Shared	57.73	2.00	0.0270	0.0040	0.7820	0.33	0.17	157.49	125.93	0	4.00	4.00	0.87	13.86	7.36
SN_17	Sidewalk	41.73	6.72	0.0273	0.0039	0.7839	0.83	0.00	134.00	76.20	1	5.00	5.00	20.37	31.15	25.76
SN_18	Shared	137.08	2.00	0.0299	0.0040	0.8153	0.22	0.67	96.03	266.74	0	4.00	3.50	1.09	4.01	2.55
SN_19	Sidewalk	42.19	4.30	0.0418	0.0040	0.8253	0.40	0.20	177.41	331.22	1	4.00	4.00	1.19	9.48	5.33
SN_20	Shared	122.39	2.00	0.0261	0.0039	0.7869	0.28	0.61	106.26	332.83	0	3.00	3.00	0.41	3.27	1.84
SN_21	Shared	31.24	2.00	0.0243	0.0037	0.7782	0.33	0.00	29.44	256.02	0	3.00	3.00	1.60	4.80	3.20
SN_22	Shared	31.64	2.00	0.0180	0.0035	0.7764	0.00	0.50	47.40	301.61	0	4.00	4.00	1.58	3.16	2.37
SN_23	Shared	122.16	2.00	0.0210	0.0037	0.7890	0.07	0.68	124.30	378.22	0	4.00	4.00	3.27	3.68	3.48
SN_24	Sidewalk	42.19	6.72	0.0385	0.0038	0.8073	0.80	0.00	6.40	219.30	1	4.00	5.00	10.67	21.33	16.00
SN_25	Shared	48.82	2.00	0.0359	0.0036	0.8207	1.00	0.00	57.84	405.27	0	3.00	4.00	19.46	27.65	23.56
SN_26	Shared	83.04	2.00	0.0287	0.0036	0.7956	0.69	0.23	107.89	302.28	0	4.00	4.50	5.42	13.85	9.63
SN_27	Sidewalk	43.02	6.38	0.0281	0.0037	0.8191	0.80	0.00	87.88	239.25	1	4.50	5.00	18.60	24.41	21.50
SN_28	Shared	82.95	2.21	0.0309	0.0036	0.7774	0.30	0.50	150.86	259.21	0	4.00	4.50	4.22	9.64	6.93
SN_29	Sidewalk	36.93	1.76	0.0422	0.0041	0.8379	0.33	0.33	124.38	151.87	1	5.00	5.00	10.83	17.60	14.22
SN_30	Sidewalk	33.00	1.76	0.0279	0.0039	0.8211	0.67	0.33	159.35	175.73	1	5.00	4.50	12.12	9.09	10.61
SN_31	Public Space	28.70	10.00	0.0383	0.0041	0.8283	0.50	0.00	148.32	142.74	1	5.00	5.00	12.20	13.94	13.07
SN_32	Sidewalk	109.46	2.76	0.0273	0.0036	0.8332	0.00	0.00	137.55	313.59	1	3.50	4.00	5.02	13.25	9.14
SN_33	Sidewalk	73.52	2.73	0.0303	0.0036	0.8198	0.00	0.00	57.13	404.71	1	3.50	4.00	2.72	8.16	5.44
SN_34	Sidewalk	52.99	3.55	0.0343	0.0036	0.8361	0.60	0.00	60.26	355.38	1	4.00	4.00	3.77	4.72	4.25
SN_35	Shared	128.10	2.00	0.0227	0.0037	0.8194	0.39	0.46	84.10	245.34	0	4.00	4.00	3.12	7.03	5.07
SN_36	Sidewalk	46.75	2.45	0.0508	0.0038	0.8272	1.00	0.00	185.21	150.97	1	5.00	5.00	19.25	16.04	17.65
SN_37	Sidewalk	48.18	2.33	0.0572	0.0038	0.8224	0.75	0.25	185.92	191.70	1	5.00	5.00	12.45	15.57	14.01
SN_38	Sidewalk	44.57	5.45	0.0692	0.0039	0.8130	1.00	0.00	139.77	62.22	1	4.00	4.50	31.41	24.68	28.04
SN_39	Sidewalk	30.96	5.63	0.0544	0.0037	0.8093	1.00	0.00	93.77	44.08	1	5.00	5.00	33.92	29.07	31.50
SN_40	Shared	127.56	2.00	0.0439	0.0037	0.7908	0.31	0.38	134.63	99.83	0	4.00	4.00	7.84	7.06	7.45
SN_41	Sidewalk	53.56	3.35	0.0370	0.0037	0.7832	1.00	0.00	43.57	26.78	1	5.00	5.00	39.21	41.07	40.14
SN_42	Sidewalk	73.75	6.35	0.0358	0.0038	0.8184	1.00	0.00	107.23	36.88	1	5.00	5.00	75.93	82.71	79.32
SN_43	Sidewalk	54.27	4.98	0.0285	0.0037	0.8157	1.00	0.00	44.48	242.63	1	5.00	5.00	25.80	23.96	24.88

ID	Path Type	Length (m)	Width (m)	Betweenness	Closeness	Straightness	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Mod. Con.	Path Obst.	PDR (am)	PDR (midday)	PDR (average)
SN_44	Sidewalk	101.39	5.54	0.0303	0.0037	0.8118	1.00	0.00	66.92	285.08	1	4.50	4.00	22.19	38.96	30.57
SN_45	Shared	39.95	2.00	0.0264	0.0038	0.7849	0.00	0.50	109.91	350.41	0	3.00	3.00	1.25	5.01	3.13
SN_46	Sidewalk	80.17	5.50	0.0504	0.0038	0.8264	0.75	0.00	80.45	340.22	1	5.00	5.00	5.61	13.72	9.67
SN_47	Sidewalk	36.85	5.04	0.0257	0.0036	0.7939	0.00	0.50	121.28	432.92	1	4.00	4.00	2.71	5.43	2.71
SN_48	Sidewalk	40.79	1.75	0.0402	0.0039	0.8269	0.00	0.00	1.01	319.82	1	4.00	4.00	2.45	6.13	3.06
SN_49	Shared	88.39	2.00	0.0329	0.0039	0.8055	0.33	0.27	65.60	255.23	0	4.00	4.00	4.53	11.88	8.20
SN_50	Public Space	28.27	28.27	0.0535	0.0040	0.8127	0.50	0.00	141.14	212.78	1	5.00	5.00	8.84	42.45	25.65
SN_51	Sidewalk	124.92	5.85	0.0421	0.0038	0.8278	0.85	0.00	78.48	183.36	1	4.50	4.00	3.60	16.81	10.21
SN_52	Sidewalk	38.54	1.92	0.0537	0.0038	0.8299	0.00	0.00	160.21	140.17	1	4.50	4.00	6.49	5.19	5.84
SN_53	Shared	56.57	2.00	0.0214	0.0038	0.7917	0.43	0.14	153.05	110.64	0	4.00	4.00	4.42	11.49	7.95
SN_54	Shared	30.86	2.00	0.0218	0.0037	0.7972	0.67	0.33	109.92	66.93	0	4.00	4.00	6.48	27.54	17.01
SN_55	Sidewalk	38.99	2.50	0.0217	0.0038	0.7878	0.00	0.00	75.00	32.00	1	4.00	4.00	2.56	17.95	10.26
SN_56	Sidewalk	38.61	6.29	0.0342	0.0039	0.8089	1.00	0.00	119.13	51.13	1	5.00	5.00	16.83	29.78	23.31
SN_57	Shared	39.71	2.00	0.0240	0.0038	0.7826	0.00	0.00	119.68	51.67	0	4.00	4.00	12.59	8.81	10.70
SN_58	Shared	87.82	2.00	0.0188	0.0038	0.7876	0.25	0.58	182.75	115.44	0	4.00	4.00	4.55	6.83	5.69
SN_59	Shared	93.30	2.21	0.0573	0.0039	0.8217	0.87	0.00	147.65	186.57	0	4.00	3.00	3.22	30.01	16.61
SN_60	Shared	36.15	2.05	0.0609	0.0039	0.8223	0.00	0.00	86.72	122.46	0	3.00	4.00	1.38	16.60	8.99
SN_61	Pedestrian Alley	38.39	2.00	0.0288	0.0039	0.7798	0.00	0.00	71.78	165.47	1	4.50	5.00	7.81	3.91	5.86
SN_62	Sidewalk	36.86	5.53	0.0424	0.0039	0.8176	0.50	0.00	107.59	299.55	1	5.00	4.00	2.71	12.21	7.46
SN_63	Sidewalk	130.20	4.74	0.0507	0.0038	0.8289	0.82	0.09	83.25	296.97	1	4.00	4.00	9.98	16.90	13.44
SN_64	Sidewalk	42.13	8.43	0.0492	0.0038	0.8008	1.00	0.00	37.76	210.80	1	5.00	5.00	18.99	26.11	22.55
SN_65	Shared	63.31	2.00	0.0413	0.0037	0.7802	0.29	0.43	89.70	321.43	0	4.00	4.00	1.58	3.16	2.37
SN_66	Public Space	41.42	5.23	0.0227	0.0037	0.7670	0.00	0.00	52.06	337.90	1	4.00	5.00	1.21	6.04	3.62
SN_67	Sidewalk	37.43	5.52	0.0424	0.0036	0.8122	1.00	0.00	34.99	242.60	1	5.00	5.00	14.70	25.38	20.04
SN_68	Sidewalk	37.64	6.45	0.0410	0.0038	0.8182	1.00	0.00	75.78	164.37	1	4.50	5.00	21.26	29.23	25.24
SN_69	Sidewalk	77.34	6.75	0.0666	0.0040	0.8163	1.00	0.00	132.95	58.72	1	5.00	5.00	27.80	59.48	43.64
SN_70	Shared	40.93	2.00	0.0300	0.0039	0.7875	1.00	0.00	154.89	80.66	0	3.00	4.00	6.11	48.86	27.49
SN_71	Shared	43.61	2.00	0.0532	0.0040	0.8067	1.00	0.00	153.36	164.25	0	4.00	4.00	5.73	10.32	8.03
SN_72	Sidewalk	44.14	4.59	0.0468	0.0039	0.8260	1.00	0.00	148.67	271.07	1	5.00	3.00	7.93	22.65	15.29
SN_73	Shared	115.40	2.00	0.0317	0.0039	0.8008	0.80	0.16	184.30	241.63	0	4.00	4.00	6.50	25.13	15.81
SN_74	Pedestrian	46.19	13.00	0.0633	0.0039	0.8262	1.00	0.00	193.84	234.00	1	5.00	5.00	12.99	71.45	42.22
SN_75	Pedestrian	68.46	13.00	0.0713	0.0040	0.8193	1.00	0.00	182.61	176.68	1	5.00	5.00	17.53	108.82	63.17
SN_76	Arcade	41.87	2.50	0.0562	0.0039	0.7997	1.00	0.00	237.77	190.28	1	5.00	5.00	13.14	21.49	17.31
SN_77	Shared	54.43	2.00	0.0463	0.0039	0.7830	0.83	0.00	182.74	111.43	0	4.00	4.00	7.35	9.19	8.27
SN_78	Shared	60.55	2.00	0.0112	0.0037	0.7496	0.75	0.00	126.85	84.83	0	4.00	4.00	4.95	4.95	4.95
SN_79	Sidewalk	44.13	6.37	0.0273	0.0036	0.8019	1.00	0.00	93.38	22.07	1	4.00	4.50	16.99	36.26	26.62
SN_80	Sidewalk	55.95	6.25	0.0406	0.0038	0.8047	1.00	0.00	143.42	72.11	1	5.00	5.00	20.55	30.38	25.47
SN_81	Sidewalk	22.43	5.05	0.0202	0.0040	0.8223	1.00	0.00	250.15	200.76	1	4.50	4.00	17.83	33.43	25.63
SN_82	Shared	107.56	2.06	0.0401	0.0038	0.7988	0.64	0.27	203.53	317.97	0	4.00	4.00	1.39	10.69	6.04
SN_83	Shared	38.31	2.00	0.0248	0.0036	0.7715	0.00	1.00	93.61	428.55	0	4.00	4.00	2.61	3.92	1.96
SN_84	Shared	35.61	2.00	0.0249	0.0037	0.7662	0.00	1.00	176.55	348.09	0	4.00	4.00	2.81	2.81	2.81
SN_85	Sidewalk	49.29	2.33	0.0253	0.0036	0.7731	0.50	0.17	128.84	398.31	1	3.00	3.50	2.03	11.16	6.59
SN_86	Sidewalk	62.89	1.98	0.0295	0.0035	0.7829	0.80	0.00	93.45	342.22	1	3.00	4.00	2.39	4.77	3.58
SN_87	Shared	53.50	2.00	0.0284	0.0035	0.7829	0.00	0.33	88.76	284.03	0	4.00	4.00	0.93	2.80	1.87
SN_88	Shared	107.47	2.00	0.0288	0.0038	0.7967	0.48	0.48	207.04	243.28	0	4.00	4.00	5.12	4.19	4.65

Taipei – Zhongxiao-Fuxing

ID	Path Type	Length (m)	Width (m)	Betweenness	Closeness	Straightness	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Mod. Con.	Path Obst.	PDR (am)	PDR (midday)	PDR (average)
ZF_1	Sidewalk	54.90	2.26	0.0237	0.0037	0.8006	0.33	0.67	62.92	411.33	1	3.00	4.00	1.82	2.73	2.28
ZF_2	Shared	48.31	2.00	0.0311	0.0039	0.8332	0.43	0.43	72.04	291.22	0	3.00	3.50	4.14	2.07	3.10
ZF_3	Shared	58.67	2.00	0.0325	0.0039	0.8061	0.14	0.71	146.30	334.38	0	3.00	4.00	1.70	1.70	1.70
ZF_4	Shared	42.78	2.00	0.0402	0.0038	0.8112	0.22	0.67	95.58	302.19	0	3.00	4.00	1.17	1.17	1.17
ZF_5	Public Space	18.12	4.00	0.0161	0.0038	0.7801	0.50	0.17	69.68	253.69	1	4.50	5.00	2.76	5.52	4.14
ZF_6	Public Space	21.57	4.00	0.0295	0.0038	0.8034	0.00	0.00	52.67	217.75	1	4.50	5.00	6.95	4.64	5.80
ZF_7	Public Space	16.49	16.49	0.0309	0.0040	0.8030	0.86	0.00	138.82	292.85	1	5.00	5.00	48.51	12.13	30.32
ZF_8	Shared	31.26	2.00	0.0430	0.0041	0.8222	0.20	0.80	197.68	298.38	0	3.00	4.00	3.20	3.20	3.20
ZF_9	Shared	17.28	2.00	0.0623	0.0042	0.7939	1.00	0.00	153.59	209.67	0	4.00	4.50	11.57	17.36	14.47
ZF_10	Public Space	17.55	2.50	0.0361	0.0038	0.7807	0.67	0.00	120.55	80.69	1	5.00	5.00	2.85	8.55	5.70
ZF_11	Public Space	16.44	2.50	0.0394	0.0039	0.7916	0.80	0.00	137.55	97.69	1	5.00	5.00	6.08	15.21	10.64
ZF_12	Shared	27.99	2.00	0.0399	0.0036	0.7903	1.00	0.00	53.86	14.00	0	4.00	4.50	10.72	21.44	16.08
ZF_13	Sidewalk	59.20	8.05	0.0444	0.0037	0.8342	1.00	0.00	69.46	29.60	1	5.00	4.00	16.05	27.87	21.96
ZF_14	Sidewalk	116.99	6.22	0.0443	0.0038	0.8141	0.94	0.00	3.60	117.70	1	4.00	5.00	12.39	17.10	14.74
ZF_15	Shared	91.44	2.00	0.0451	0.0040	0.7887	0.48	0.48	210.68	192.00	0	3.00	3.50	1.09	7.11	4.10
ZF_16	Shared	36.68	2.00	0.0426	0.0040	0.7938	0.20	0.60	240.41	256.06	0	3.00	4.00	4.09	1.36	2.73
ZF_17	Shared	97.05	2.00	0.0375	0.0040	0.7972	0.11	0.79	270.68	306.29	0	4.00	4.00	1.55	3.09	2.32
ZF_18	Sidewalk	96.74	1.75	0.0471	0.0040	0.7860	0.29	0.59	270.44	286.09	0	3.00	3.00	1.55	5.69	3.62
ZF_19	Shared	31.91	2.00	0.0650	0.0040	0.7967	0.57	0.43	170.29	201.57	0	3.00	4.00	3.13	3.13	3.13
ZF_20	Shared	118.64	2.00	0.0579	0.0038	0.7907	0.25	0.63	166.16	126.30	0	4.00	4.00	1.26	2.53	1.90
ZF_21	Sidewalk	93.55	1.69	0.0303	0.0038	0.7915	0.46	0.38	151.70	328.02	1	4.00	4.00	2.67	2.14	2.41
ZF_22	Sidewalk	36.94	5.83	0.0301	0.0037	0.8045	1.00	0.00	33.59	236.75	1	4.50	5.00	20.30	9.47	14.89
ZF_23	Sidewalk	29.29	1.75	0.0485	0.0039	0.8053	0.50	0.50	126.88	311.64	1	4.00	3.50	5.12	3.41	4.27
ZF_24	Sidewalk	73.87	2.07	0.0519	0.0039	0.8043	0.00	0.00	206.76	389.79	1	3.00	4.00	3.38	2.03	2.71
ZF_25	Sidewalk	47.23	1.50	0.0458	0.0039	0.8068	0.00	0.00	195.77	460.38	1	5.00	5.00	5.29	2.12	3.71
ZF_26	Shared	62.67	2.00	0.0151	0.0037	0.7503	0.00	1.00	227.90	421.66	0	3.00	4.00	3.99	3.19	3.59
ZF_27	Shared	41.08	2.00	0.0172	0.0036	0.7528	0.00	1.00	176.03	369.79	0	3.00	4.00	1.22	8.52	4.87
ZF_28	Shared	45.98	2.00	0.0236	0.0035	0.7841	0.00	0.50	132.50	372.24	0	3.00	4.00	2.17	7.61	4.89
ZF_29	Sidewalk	52.41	4.74	0.0309	0.0034	0.8118	0.67	0.00	83.30	380.91	1	4.00	5.00	8.59	7.63	8.11
ZF_30	Sidewalk	81.87	6.74	0.0393	0.0036	0.8179	1.00	0.00	23.04	223.35	1	5.00	5.00	33.59	18.93	26.26
ZF_31	Sidewalk	108.03	1.27	0.0394	0.0039	0.7859	0.00	0.88	124.60	276.37	0	2.00	2.00	0.46	0.46	0.46
ZF_32	Shared (Defacto)	108.10	1.50	0.0391	0.0032	0.7851	0.00	1.00	133.44	267.61	0	2.00	2.00	0.46	0.46	0.46
ZF_33	Shared	103.96	2.00	0.0270	0.0039	0.7709	0.00	0.88	162.49	314.25	0	4.00	4.00	1.44	2.40	1.92
ZF_34	Shared	43.28	2.00	0.0404	0.0038	0.7855	0.00	0.00	101.03	191.91	0	3.00	4.00	2.31	4.62	3.47
ZF_35	Path	20.76	1.50	0.0163	0.0038	0.7543	0.00	1.00	118.49	190.89	1	3.00	3.00	1.20	1.20	0.60
ZF_36	Path	19.74	1.50	0.0161	0.0037	0.7463	0.00	1.00	98.24	170.64	1	3.00	3.00	1.27	1.27	0.63
ZF_37	Path	37.31	1.50	0.0419	0.0040	0.7822	0.00	1.00	202.08	297.51	1	3.00	3.00	1.34	1.34	1.34
ZF_38	Path	25.14	2.12	0.0416	0.0039	0.7965	0.00	1.00	170.85	328.73	1	3.00	3.00	1.99	1.99	1.99
ZF_39	Shared	27.01	2.00	0.0565	0.0039	0.8163	0.67	0.33	125.74	294.35	0	3.00	4.00	3.70	12.96	8.33
ZF_40	Shared	35.75	2.00	0.0442	0.0039	0.7720	0.50	0.50	157.12	262.97	0	3.00	4.00	2.80	6.99	4.90
ZF_41	Shared	29.78	2.00	0.0415	0.0038	0.7613	0.60	0.40	157.82	230.21	0	3.00	4.00	3.36	11.75	7.56
ZF_42	Sidewalk	43.78	3.16	0.0329	0.0036	0.7974	0.83	0.00	153.50	96.01	1	5.00	5.00	3.43	11.42	7.42
ZF_43	Sidewalk	69.56	3.46	0.0408	0.0036	0.8079	1.00	0.00	112.52	64.85	1	5.00	5.00	11.50	17.97	14.74
ZF_44	Public Space	69.56	10.00	0.0401	0.0036	0.8097	1.00	0.00	95.82	48.15	1	5.00	5.00	7.91	6.47	7.19
ZF_45	Sidewalk	17.70	6.66	0.0489	0.0037	0.8164	1.00	0.00	68.88	21.22	1	5.00	5.00	28.25	59.32	43.79

ID	Path Type	Length (m)	Width (m)	Betweenness	Closeness	Straightness	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Mod. Con.	Path Obst.	PDR (am)	PDR (midday)	PDR (average)
ZF_46	Sidewalk	69.40	6.66	0.0485	0.0037	0.8126	1.00	0.00	25.33	47.07	1	4.50	5.00	39.63	29.54	34.58
ZF_47	Sidewalk	111.52	3.25	0.0245	0.0036	0.7898	0.67	0.00	118.05	184.90	1	5.00	4.00	7.17	6.28	6.73
ZF_48	Sidewalk	76.21	1.55	0.0382	0.0038	0.8049	0.00	0.00	142.03	244.12	1	1.50	2.00	1.31	1.31	0.98
ZF_49	Shared	76.61	2.00	0.0270	0.0037	0.8219	0.20	0.40	229.42	245.73	0	2.00	2.00	1.31	3.26	2.28
ZF_50	Sidewalk	39.21	1.52	0.0331	0.0037	0.8375	0.33	0.33	212.55	347.30	1	5.00	3.00	1.28	3.83	2.55
ZF_51	Shared	69.19	2.00	0.0157	0.0036	0.7983	0.00	0.82	257.46	284.00	0	3.00	3.50	0.72	0.72	0.72
ZF_52	Shared	82.38	2.00	0.0284	0.0037	0.7892	0.41	0.24	148.01	334.85	0	3.00	4.00	1.82	10.32	6.07
ZF_53	Shared	80.66	2.00	0.0177	0.0035	0.7837	0.43	0.43	116.12	378.39	0	4.00	4.00	1.24	5.58	3.41
ZF_54	Shared	40.90	2.00	0.0207	0.0037	0.7689	0.50	0.50	134.76	222.42	0	3.00	3.00	7.33	7.33	7.33
ZF_55	Public Space	67.93	1.55	0.0169	0.0035	0.7229	0.33	0.00	216.69	151.48	1	5.00	5.00	1.47	2.94	2.21
ZF_56	Sidewalk	50.93	6.83	0.0429	0.0037	0.7999	1.00	0.00	139.51	87.00	1	5.00	5.00	11.78	32.40	22.09
ZF_57	Shared	62.87	2.00	0.0347	0.0037	0.7618	0.44	0.56	193.37	91.86	0	4.00	4.00	2.39	3.98	3.18
ZF_58	Shared	27.02	2.00	0.0424	0.0038	0.7929	0.60	0.00	131.84	23.64	0	3.00	4.00	1.85	14.80	8.33
ZF_59	Shared	23.28	2.00	0.0424	0.0038	0.7968	0.75	0.00	150.29	48.79	0	3.00	4.00	6.44	8.59	7.52
ZF_60	Sidewalk	43.47	1.83	0.0281	0.0037	0.7773	0.50	0.25	229.91	128.41	1	5.00	4.00	2.30	4.60	3.45
ZF_61	Shared	75.92	2.00	0.0465	0.0039	0.8042	0.17	0.75	166.79	145.25	0	3.00	3.50	5.27	1.32	3.29
ZF_62	Sidewalk	42.71	1.68	0.0498	0.0040	0.8146	0.50	0.25	150.19	204.57	1	5.00	5.00	3.51	3.51	3.51
ZF_63	Shared	49.28	2.00	0.0393	0.0039	0.8086	0.50	0.50	183.77	263.24	0	3.00	4.00	4.06	4.06	4.06
ZF_64	Public Space	27.04	2.50	0.0232	0.0039	0.7841	0.40	0.40	213.76	293.22	1	5.00	5.00	3.70	7.40	5.55
ZF_65	Public Space	21.63	2.50	0.0240	0.0039	0.7897	0.40	0.40	223.22	312.88	1	5.00	5.00	2.31	9.25	5.78
ZF_66	Shared	48.71	2.00	0.0691	0.0040	0.8332	0.80	0.00	102.50	230.96	0	4.00	3.50	8.21	4.11	6.16
ZF_67	Sidewalk	77.33	5.04	0.0261	0.0039	0.7877	0.60	0.00	126.30	239.84	1	4.00	4.00	2.59	2.59	2.59
ZF_68	Sidewalk	48.83	1.65	0.0201	0.0042	0.8394	0.67	0.00	47.17	130.13	1	4.50	5.00	2.05	11.26	6.66
ZF_69	Public Space	60.68	10.00	0.0584	0.0042	0.8499	0.92	0.00	5.06	152.64	1	5.00	5.00	9.89	50.26	30.08
ZF_70	Shared	89.70	2.00	0.0196	0.0039	0.7993	0.63	0.00	151.51	231.68	0	3.00	3.00	4.46	4.46	4.46
ZF_71	Shared	27.71	2.00	0.0185	0.0036	0.7924	0.57	0.43	222.66	346.89	0	4.00	4.00	1.80	3.61	2.71
ZF_72	Shared	25.13	2.00	0.0211	0.0036	0.7945	0.71	0.29	249.08	372.28	0	4.00	4.00	1.99	3.98	2.98
ZF_73	Shared	97.92	2.00	0.0308	0.0037	0.8197	0.96	0.00	228.87	311.98	0	3.00	4.00	8.68	25.02	16.85
ZF_74	Sidewalk	26.14	2.23	0.0255	0.0037	0.8312	1.00	0.00	243.87	325.49	1	5.00	4.50	1.91	11.48	6.69
ZF_75	Sidewalk	20.44	2.40	0.0253	0.0038	0.8340	1.00	0.00	220.58	348.77	1	5.00	4.50	41.59	19.57	30.58
ZF_76	Sidewalk	49.42	2.46	0.0404	0.0038	0.8261	1.00	0.00	218.58	273.77	1	5.00	5.00	8.09	26.31	17.20
ZF_77	Shared	34.87	2.00	0.0227	0.0039	0.8254	0.33	0.67	164.35	186.27	0	3.00	3.50	1.43	5.74	3.58
ZF_78	Shared	26.34	2.00	0.0132	0.0039	0.7990	0.83	0.17	177.68	155.66	0	3.00	4.00	7.59	15.19	11.39
ZF_79	Shared	21.60	2.00	0.0111	0.0039	0.7930	1.00	0.00	163.26	133.30	0	3.00	4.00	9.26	18.52	13.89
ZF_80	Public Space	36.59	10.00	0.0399	0.0040	0.8343	0.67	0.00	115.29	167.86	1	5.00	5.00	2.73	16.40	9.57
ZF_81	Sidewalk	79.97	6.01	0.0582	0.0040	0.8257	1.00	0.00	94.99	64.21	1	4.50	5.00	5.63	40.02	22.82
ZF_82	Shared	76.11	2.00	0.0289	0.0037	0.8001	0.89	0.00	128.62	99.20	0	3.50	2.00	25.62	9.20	17.41
ZF_83	Sidewalk	51.16	6.69	0.0460	0.0038	0.7859	1.00	0.00	41.94	102.24	1	5.00	5.00	29.32	26.39	27.85
ZF_84	Shared	41.19	2.00	0.0122	0.0038	0.7373	0.33	0.67	136.17	192.60	0	4.00	3.50	1.21	3.64	2.43
ZF_85	Shared	40.11	2.00	0.0140	0.0038	0.7498	0.75	0.25	176.82	191.03	0	4.00	4.00	1.25	12.47	6.86
ZF_86	Shared	53.10	2.00	0.0269	0.0037	0.8086	0.83	0.17	205.43	197.52	0	4.00	4.00	5.65	10.36	8.00
ZF_87	Sidewalk	82.48	2.06	0.0409	0.0038	0.8167	1.00	0.00	220.12	265.32	1	5.00	4.00	8.49	32.74	20.61
ZF_88	Shared	34.01	2.00	0.0133	0.0036	0.7848	0.33	0.33	163.16	434.03	0	3.00	3.00	1.47	2.94	2.21
ZF_89	Sidewalk	69.61	2.47	0.0290	0.0037	0.7955	0.58	0.42	130.98	261.77	1	5.00	5.00	5.03	3.59	4.31
ZF_90	Sidewalk	86.06	5.62	0.0409	0.0037	0.8149	1.00	0.00	89.43	222.58	1	5.00	4.00	15.11	19.17	17.14
ZF_91	Sidewalk	51.00	5.65	0.0205	0.0035	0.8028	0.71	0.29	68.89	317.47	1	3.50	4.00	3.92	13.73	8.82

Taipei – Xinyi Anhe

ID	Path Type	Length (m)	Width (m)	Betweenness	Closeness	Straightness	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Mod. Con.	Path Obst.	PDR (am)	PDR (midday)	PDR (average)
XA_1	Sidewalk	33.73	1.51	0.0467	0.0039	0.8214	0.50	0.50	55.78	55.19	1	5.00	5.00	4.45	2.96	3.71
XA_2	Sidewalk	102.56	6.55	0.0392	0.0038	0.8154	0.67	0.11	76.65	103.14	1	4.50	5.00	4.39	11.70	8.04
XA_3	Sidewalk	102.85	7.56	0.0466	0.0037	0.8281	0.75	0.08	89.37	243.01	1	4.50	5.00	4.86	16.04	10.45
XA_4	Shared	38.31	2.00	0.0128	0.0038	0.7942	0.25	0.75	73.46	288.27	0	3.00	2.50	1.31	5.22	3.26
XA_5	Shared	23.51	2.00	0.0221	0.0039	0.7963	0.33	0.67	104.37	258.55	0	3.00	3.00	2.13	4.25	3.19
XA_6	Shared	23.78	2.00	0.0318	0.0037	0.7916	0.00	1.00	120.62	147.05	0	3.00	4.00	2.10	2.10	1.05
XA_7	Shared	76.38	2.00	0.0386	0.0038	0.7925	0.40	0.20	189.34	235.73	0	4.00	4.00	5.24	5.89	5.56
XA_8	Shared	42.15	2.00	0.0243	0.0038	0.7719	0.00	1.00	227.17	253.49	0	3.00	4.00	3.56	2.37	2.97
XA_9	Shared	41.88	2.00	0.0454	0.0038	0.7897	0.00	0.50	168.09	311.10	0	3.00	4.00	4.78	4.78	2.39
XA_10	Shared	62.14	2.00	0.0313	0.0038	0.7793	0.17	0.50	220.10	304.99	0	4.00	4.00	2.41	3.22	2.82
XA_11	Sidewalk	41.73	2.01	0.0266	0.0037	0.8152	0.60	0.40	114.47	259.49	1	4.00	4.00	2.40	4.79	3.59
XA_12	Sidewalk	59.08	2.15	0.0327	0.0039	0.8242	0.75	0.13	207.05	393.81	1	5.00	5.00	9.31	15.23	12.27
XA_13	Sidewalk	72.74	2.01	0.0193	0.0036	0.8196	0.50	0.33	167.95	354.71	1	5.00	3.00	8.25	4.12	6.19
XA_14	Sidewalk	128.09	4.85	0.0308	0.0036	0.8322	0.55	0.18	86.16	331.13	1	4.00	5.00	4.68	8.59	6.64
XA_15	Sidewalk	67.89	1.55	0.0204	0.0036	0.8202	0.50	0.50	56.06	301.03	1	5.00	5.00	0.74	8.84	4.79
XA_16	Sidewalk	40.60	2.55	0.0212	0.0037	0.8031	0.67	0.00	49.48	195.49	1	3.50	4.50	4.93	1.23	3.08
XA_17	Shared	67.90	2.00	0.0353	0.0039	0.8245	0.13	0.75	128.67	119.13	0	3.00	3.00	2.21	1.47	1.84
XA_18	Sidewalk	46.50	3.76	0.0303	0.0039	0.8008	0.67	0.33	135.42	108.43	1	4.00	5.00	5.38	1.08	3.23
XA_19	Shared	60.65	2.00	0.0367	0.0038	0.7743	0.33	0.33	146.21	116.03	0	3.00	4.00	2.47	1.65	2.06
XA_20	Shared	19.73	2.00	0.0415	0.0038	0.8090	0.86	0.14	153.32	115.02	0	4.00	4.50	15.21	50.68	32.94
XA_21	Shared	23.54	2.00	0.0403	0.0037	0.8047	1.00	0.00	137.66	136.66	0	4.00	4.50	4.25	33.98	19.12
XA_22	Shared	72.90	2.00	0.0424	0.0037	0.8152	0.64	0.14	108.03	184.88	0	4.00	4.00	2.74	5.49	4.12
XA_23	Shared	82.64	2.00	0.0409	0.0036	0.8174	0.30	0.40	129.00	381.81	0	3.00	3.50	3.03	1.21	2.12
XA_24	Shared	60.26	2.00	0.0407	0.0037	0.8236	0.79	0.14	168.11	316.23	0	3.00	4.00	9.13	12.45	10.79
XA_25	Sidewalk	52.30	3.15	0.0389	0.0037	0.8211	0.75	0.17	112.88	259.95	1	5.00	5.00	6.69	17.21	11.95
XA_26	Shared	38.01	2.00	0.0292	0.0037	0.8138	1.00	0.00	105.73	252.81	0	3.00	4.00	5.26	28.94	17.10
XA_27	Shared	53.62	2.00	0.0410	0.0038	0.8243	0.93	0.00	78.40	298.63	0	3.00	4.00	3.73	29.84	16.78
XA_28	Sidewalk	42.86	5.24	0.0538	0.0038	0.8377	0.80	0.00	30.16	281.04	1	5.00	5.00	7.00	11.67	9.33
XA_29	Shared	70.75	2.00	0.0302	0.0038	0.8191	0.88	0.12	85.20	194.96	0	3.00	4.00	7.07	9.19	8.13
XA_30	Shared	20.26	2.00	0.0373	0.0038	0.8074	0.50	0.50	118.88	158.56	0	3.00	3.50	4.94	2.47	3.70
XA_31	Shared	42.82	2.00	0.0307	0.0037	0.8181	0.71	0.29	66.91	258.53	0	3.00	4.00	4.67	9.34	7.01
XA_32	Shared	97.83	2.00	0.0272	0.0036	0.7962	0.35	0.50	137.24	315.79	0	3.00	3.50	2.04	5.11	3.58
XA_33	Shared	46.23	2.00	0.0285	0.0035	0.7839	0.30	0.60	209.27	386.84	0	3.00	3.00	2.16	5.41	3.79
XA_34	Shared	53.84	2.00	0.0350	0.0036	0.7884	0.54	0.15	193.26	422.76	0	3.50	3.00	4.64	5.57	5.11
XA_35	Sidewalk	36.66	3.98	0.0329	0.0040	0.8366	1.00	0.00	105.44	373.62	1	5.00	5.00	27.28	75.01	51.15
XA_36	Sidewalk	25.14	5.13	0.0336	0.0038	0.8381	1.00	0.00	101.39	181.32	1	5.00	5.00	51.71	91.49	71.60
XA_37	Shared (Defacto)	101.07	2.00	0.0228	0.0036	0.8066	0.72	0.00	194.34	248.72	0	3.00	3.00	1.98	5.94	3.96
XA_38	Shared	76.43	2.00	0.0208	0.0035	0.7996	0.33	0.44	213.45	283.21	0	3.00	4.00	1.31	4.58	2.94
XA_39	Sidewalk	146.30	5.60	0.0283	0.0035	0.8069	0.78	0.00	113.69	171.85	1	5.00	5.00	6.15	17.77	11.96
XA_40	Sidewalk	85.66	8.88	0.0428	0.0039	0.8257	1.00	0.00	89.00	42.83	1	5.00	5.00	36.77	50.20	43.49
XA_41	Sidewalk	77.07	6.10	0.0433	0.0040	0.7948	0.67	0.00	64.79	38.53	1	5.00	4.50	11.03	7.79	9.41
XA_42	Shared	85.50	2.00	0.0433	0.0038	0.7996	0.15	0.62	146.32	115.01	0	3.00	3.50	2.92	1.75	2.34
XA_43	Sidewalk	45.88	3.44	0.0513	0.0038	0.8329	0.83	0.17	126.51	154.01	1	5.00	5.00	6.54	13.08	9.81
XA_44	Sidewalk	76.73	6.74	0.0190	0.0034	0.7775	0.67	0.17	172.96	242.82	1	3.50	5.00	7.82	3.91	5.86
XA_45	Pedestrian Alley	39.53	2.00	0.0106	0.0034	0.7733	0.00	1.00	177.46	354.35	0	4.00	3.00	2.53	2.53	2.53

ID	Path Type	Length (m)	Width (m)	Betweenness	Closeness	Straightness	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Mod. Con.	Path Obst.	PDR (am)	PDR (midday)	PDR (average)
XA_46	Shared	158.41	2.00	0.0176	0.0036	0.8050	0.05	0.89	239.50	295.22	0	3.00	4.00	2.53	3.16	2.84
XA_47	Sidewalk	98.38	3.56	0.0406	0.0039	0.8465	0.64	0.09	255.10	310.82	1	4.00	4.00	4.57	3.56	4.07
XA_48	Shared	68.97	2.00	0.0214	0.0037	0.7557	0.00	0.67	203.89	383.02	0	3.00	4.00	2.17	1.45	1.81
XA_49	Shared (Defacto)	33.00	2.00	0.0323	0.0040	0.8137	0.75	0.25	272.50	400.97	0	3.00	3.50	4.55	13.64	9.09
XA_50	Sidewalk	22.71	2.05	0.0310	0.0039	0.8015	0.50	0.25	252.06	373.11	1	3.50	3.50	4.40	4.40	4.40
XA_51	Shared (Defacto)	65.67	2.00	0.0385	0.0039	0.8103	0.08	0.83	268.67	328.92	0	3.00	3.00	3.81	3.05	3.43
XA_52	Shared	46.55	2.00	0.0443	0.0039	0.8194	0.86	0.14	236.27	360.24	0	3.00	4.00	5.37	5.37	5.37
XA_53	Shared (Defacto)	109.99	2.00	0.0450	0.0039	0.8133	0.18	0.73	233.37	372.39	0	3.00	2.00	2.27	1.36	1.82
XA_54	Sidewalk	59.04	2.06	0.0281	0.0038	0.8317	0.71	0.29	148.86	346.92	1	5.00	5.00	5.08	5.08	5.08
XA_55	Sidewalk	40.62	1.50	0.0212	0.0038	0.8107	0.50	0.50	198.69	315.13	1	5.00	5.00	2.46	2.46	2.46
XA_56	Sidewalk	59.83	1.66	0.0227	0.0038	0.8185	0.43	0.57	205.17	265.42	1	5.00	5.00	3.34	0.84	2.09
XA_57	Shared	95.84	2.00	0.0493	0.0038	0.8108	0.13	0.80	220.20	254.95	0	3.00	4.00	2.09	1.04	1.57
XA_58	Public Space	29.55	7.00	0.0378	0.0039	0.8097	0.50	0.00	131.58	159.46	1	5.00	5.00	27.08	6.77	16.92
XA_59	Shared	43.21	2.00	0.0551	0.0038	0.7963	0.00	1.00	119.91	93.86	0	3.00	3.00	1.16	1.16	1.16
XA_60	Sidewalk	40.29	4.25	0.0480	0.0040	0.8303	0.67	0.00	45.40	78.25	1	5.00	5.00	23.58	16.13	19.86
XA_61	Shared	76.25	2.00	0.0524	0.0040	0.8321	0.38	0.56	59.75	183.40	0	3.00	3.00	0.66	3.28	1.97
XA_62	Sidewalk	34.50	5.44	0.0409	0.0039	0.8397	0.67	0.33	42.09	165.74	1	4.00	4.00	1.45	1.45	1.45
XA_63	Shared	108.16	2.00	0.0336	0.0038	0.7948	0.19	0.81	113.42	237.07	0	3.00	3.00	1.85	0.92	1.39
XA_64	Sidewalk	43.09	5.25	0.0383	0.0038	0.8355	0.67	0.33	80.89	204.54	1	4.00	4.50	15.08	2.32	8.70
XA_65	Sidewalk	79.29	4.08	0.0313	0.0037	0.8509	0.88	0.13	105.63	272.09	1	4.50	5.00	6.31	10.09	8.20
XA_66	Sidewalk	74.55	3.74	0.0359	0.0037	0.8503	0.50	0.00	88.55	296.05	1	4.50	5.00	6.04	6.71	6.37
XA_67	Shared	66.30	2.00	0.0329	0.0037	0.8335	0.60	0.20	141.84	288.41	0	4.00	5.00	8.30	1.51	4.90
XA_68	Sidewalk	46.67	4.58	0.0236	0.0037	0.8028	0.00	0.25	151.79	298.28	1	4.00	3.00	2.14	2.14	1.07
XA_69	Sidewalk	36.87	5.05	0.0386	0.0040	0.8433	1.00	0.00	3.41	149.98	1	5.00	5.00	20.34	10.85	15.60
XA_70	Sidewalk	66.79	6.76	0.0224	0.0039	0.8041	0.50	0.00	80.89	59.99	1	4.50	5.00	7.49	5.24	6.36
XA_71	Sidewalk	57.78	1.74	0.0089	0.0038	0.7944	0.50	0.00	76.38	122.27	1	4.00	5.00	1.73	1.73	1.73
XA_72	Shared	133.85	2.00	0.0305	0.0036	0.7682	0.62	0.33	157.62	211.97	0	3.50	4.00	2.24	8.59	5.42
XA_73	Shared	57.62	2.00	0.0243	0.0035	0.7366	0.75	0.25	168.37	249.78	0	3.00	3.00	4.34	7.81	6.07
XA_74	Sidewalk	110.27	5.63	0.0444	0.0035	0.7858	0.83	0.08	84.42	276.10	1	5.00	5.00	8.16	11.34	9.75
XA_75	Shared	79.59	2.00	0.0253	0.0035	0.7441	0.33	0.67	203.80	402.56	0	3.00	3.00	1.88	1.88	1.88
XA_76	Shared	58.33	2.00	0.0311	0.0036	0.7770	0.00	1.00	176.65	432.24	0	4.00	4.00	2.57	2.57	2.14
XA_77	Shared	107.95	2.00	0.0242	0.0036	0.8067	0.45	0.45	159.80	286.02	0	4.00	4.00	2.32	3.24	2.78
XA_78	Sidewalk	42.88	1.76	0.0333	0.0038	0.8007	0.60	0.40	121.08	210.60	1	4.00	3.50	3.50	1.17	2.33
XA_79	Shared	66.66	2.00	0.0255	0.0039	0.8046	0.40	0.60	95.50	117.74	0	4.00	4.00	1.50	3.00	2.25
XA_80	Shared	79.31	2.00	0.0258	0.0037	0.8005	0.25	0.63	171.23	357.99	0	3.00	4.00	3.78	11.98	7.88
XA_81	Path	41.73	1.25	0.0115	0.0038	0.7657	0.00	0.50	165.68	293.77	0	1.50	3.00	2.40	2.40	1.20
XA_82	Shared	34.29	2.00	0.0139	0.0037	0.7809	0.00	1.00	127.67	255.76	0	3.00	4.00	1.46	1.46	1.46
XA_83	Pedestrian Alley	62.79	1.25	0.0423	0.0038	0.7835	0.00	1.00	178.54	258.77	0	3.00	4.00	1.59	1.19	0.60
XA_84	Shared	34.53	2.00	0.0216	0.0036	0.7899	0.00	1.00	105.59	249.61	0	3.00	3.00	1.45	1.45	1.45
XA_85	Sidewalk	67.83	1.39	0.0267	0.0036	0.8278	0.75	0.25	46.18	291.15	1	4.00	4.00	4.42	2.95	3.69

Appendix M: Tokyo Datasets

Tokyo – Ikebukuro

ID	Path Type	Length (m)	Width (m)	Betweenness	Closeness	Straightness	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Mod. Con.	Path Obst.	PDR (am)	PDR (midday)	PDR (average)
IK_1	Sidewalk	105.91	2.93	0.0264	0.0037	0.7864	0.75	0.00	117.22	104.83	1	4.00	4.50	6.14	25.97	16.05
IK_2	Sidewalk	53.02	2.75	0.0068	0.0035	0.7840	0.00	0.00	124.89	215.98	1	5.00	5.00	5.66	12.26	8.96
IK_3	Sidewalk	53.39	2.50	0.0154	0.0036	0.7901	0.60	0.00	136.81	222.42	1	4.00	3.00	0.94	1.87	1.40
IK_4	Shared	73.85	2.00	0.0168	0.0037	0.7723	0.00	0.00	135.97	174.97	0	3.00	3.50	0.68	1.35	1.02
IK_5	Sidewalk	31.02	3.20	0.0143	0.0038	0.7876	0.75	0.00	149.67	122.54	1	4.50	4.00	4.84	16.12	10.48
IK_6	Sidewalk	47.10	3.35	0.0145	0.0038	0.7983	0.86	0.00	110.61	84.10	1	5.00	4.00	14.86	27.60	21.23
IK_7	Sidewalk	32.91	3.18	0.0235	0.0039	0.7959	0.67	0.00	232.14	183.49	1	4.00	4.00	3.04	3.04	3.04
IK_8	Shared	38.97	2.00	0.0090	0.0039	0.7954	0.40	0.00	226.74	246.04	0	3.00	4.00	0.00	1.28	0.65
IK_9	Sidewalk	34.75	2.54	0.0366	0.0040	0.8351	0.86	0.00	177.44	218.35	1	4.00	4.00	4.32	5.76	5.04
IK_10	Sidewalk	31.07	2.72	0.0418	0.0040	0.8264	0.80	0.00	144.53	190.50	1	4.50	5.00	3.22	9.66	6.44
IK_11	Pedestrian	26.11	7.35	0.0424	0.0040	0.8097	1.00	0.00	177.87	144.02	1	4.00	4.50	9.57	17.23	13.40
IK_12	Pedestrian	30.93	7.69	0.0425	0.0040	0.8060	1.00	0.00	149.35	115.50	1	5.00	5.00	11.32	17.78	14.55
IK_13	Pedestrian	46.73	7.55	0.0508	0.0041	0.8216	1.00	0.00	110.52	76.67	1	5.00	4.50	16.05	26.75	21.40
IK_14	Sidewalk	31.56	3.52	0.0363	0.0041	0.8093	1.00	0.00	69.37	35.52	1	4.50	4.00	7.92	30.10	19.01
IK_15	Pedestrian	21.06	4.93	0.0239	0.0040	0.7998	1.00	0.00	42.60	45.76	1	4.00	4.50	7.12	16.62	11.87
IK_16	Pedestrian	28.52	4.45	0.0270	0.0041	0.7868	1.00	0.00	17.80	22.12	1	4.50	4.50	12.27	15.78	14.03
IK_17	Shared	44.24	2.00	0.0263	0.0039	0.7987	0.83	0.00	63.20	28.25	0	3.00	4.00	2.26	5.65	3.96
IK_18	Sidewalk	25.04	2.43	0.0225	0.0038	0.8243	0.80	0.00	21.79	37.67	1	5.00	5.00	9.98	9.98	9.98
IK_19	Sidewalk	23.49	1.84	0.0060	0.0037	0.7994	1.00	0.00	58.08	12.61	1	4.50	5.00	0.00	8.51	4.27
IK_20	Sidewalk	35.51	2.11	0.0167	0.0038	0.8010	1.00	0.00	56.82	18.62	1	5.00	5.00	7.04	25.34	16.19
IK_21	Shared	58.02	2.00	0.0234	0.0038	0.7801	1.00	0.00	99.59	56.36	0	3.00	4.00	5.17	11.20	8.19
IK_22	Sidewalk	44.37	1.56	0.0195	0.0037	0.8112	0.75	0.00	156.45	125.75	1	5.00	5.00	2.25	7.89	5.07
IK_23	Sidewalk	51.65	1.59	0.0201	0.0037	0.8345	0.50	0.00	159.36	174.08	1	4.00	5.00	9.68	0.97	5.32
IK_24	Sidewalk	55.37	2.91	0.0343	0.0036	0.8415	1.00	0.00	150.36	162.79	1	4.00	4.00	8.13	19.87	14.00
IK_25	Sidewalk	40.69	2.50	0.0245	0.0036	0.8120	0.50	0.00	209.29	166.35	1	4.00	4.00	2.46	9.83	6.14
IK_26	Sidewalk	51.59	2.59	0.0387	0.0037	0.7940	0.50	0.00	241.40	212.49	1	4.50	4.00	10.66	16.48	13.57
IK_27	Sidewalk	103.47	3.38	0.0255	0.0037	0.8237	0.89	0.00	128.54	109.04	1	5.00	5.00	10.15	32.86	21.50
IK_28	Sidewalk	77.90	3.86	0.0202	0.0038	0.8300	1.00	0.00	27.67	129.14	1	5.00	5.00	29.53	38.51	34.02
IK_29	Sidewalk	49.61	8.68	0.0195	0.0038	0.8034	1.00	0.00	43.22	24.81	1	5.00	5.00	63.50	150.17	106.83
IK_30	Sidewalk	41.80	8.59	0.0185	0.0038	0.8151	1.00	0.00	2.49	20.90	1	5.00	5.00	62.20	138.76	89.71
IK_31	Pedestrian	55.37	5.01	0.0362	0.0040	0.8184	1.00	0.00	86.65	27.69	1	5.00	4.00	27.09	27.09	27.09
IK_32	Sidewalk	43.89	3.37	0.0372	0.0040	0.8240	1.00	0.00	49.56	31.49	1	5.00	4.00	12.53	31.90	22.21
IK_33	Sidewalk	25.26	7.23	0.0383	0.0040	0.8060	1.00	0.00	5.44	12.63	1	5.00	5.00	33.65	39.59	36.62
IK_34	Sidewalk	45.47	7.18	0.0384	0.0039	0.8115	1.00	0.00	8.76	22.74	1	5.00	5.00	24.19	37.39	30.79
IK_35	Shared	58.43	2.00	0.0235	0.0038	0.8047	0.71	0.00	54.28	87.11	0	1.50	2.50	1.71	5.13	3.42
IK_36	Sidewalk	86.73	3.02	0.0209	0.0038	0.8101	1.00	0.00	83.16	73.54	1	4.50	5.00	35.17	42.66	38.91
IK_37	Sidewalk	27.04	2.64	0.0489	0.0038	0.8269	0.80	0.00	34.37	24.75	1	4.00	4.00	5.55	29.59	17.57
IK_38	Sidewalk	41.33	2.51	0.0442	0.0037	0.7885	1.00	0.00	65.50	55.88	1	4.50	5.00	13.31	36.29	24.80
IK_39	Public Space	62.72	3.59	0.0076	0.0034	0.7701	0.00	0.00	204.97	195.35	1	4.00	4.00	3.19	4.78	3.99
IK_40	Public Space	65.17	3.66	0.0188	0.0035	0.7870	0.00	0.00	241.46	259.30	1	4.00	4.00	6.14	3.84	4.99
IK_41	Shared	68.77	2.00	0.0163	0.0036	0.7974	0.85	0.00	149.53	139.91	0	3.00	4.00	8.72	8.00	8.36
IK_42	Shared	46.44	2.00	0.0328	0.0039	0.8191	1.00	0.00	107.86	174.19	0	3.00	4.00	5.38	17.23	11.30
IK_43	Sidewalk	75.17	3.58	0.0393	0.0040	0.8360	0.89	0.00	73.48	154.28	1	4.50	4.00	2.00	13.30	7.65

ID	Path Type	Length (m)	Width (m)	Betweenness	Closeness	Straightness	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Mod. Con.	Path Obst.	PDR (am)	PDR (midday)	PDR (average)
IK_44	Shared	38.54	2.00	0.0592	0.0039	0.8360	0.86	0.00	58.39	132.75	0	4.50	4.50	42.81	53.19	48.00
IK_45	Shared	59.62	2.00	0.0324	0.0040	0.7936	0.17	0.00	110.67	207.40	0	3.00	4.00	1.68	4.19	2.94
IK_46	Public Space	49.55	20.00	0.0308	0.0038	0.8359	0.50	0.00	86.60	200.29	1	5.00	5.00	33.30	54.49	43.90
IK_47	Shared	49.69	2.00	0.0170	0.0040	0.8164	0.67	0.00	122.07	139.70	0	3.00	4.00	5.03	20.12	12.58
IK_48	Pedestrian	61.78	14.93	0.0409	0.0037	0.8459	1.00	0.00	126.33	187.06	1	5.00	5.00	125.45	100.36	112.90
IK_49	Pedestrian Alley	58.28	1.00	0.0076	0.0034	0.7592	0.00	1.00	97.87	274.24	0	4.00	3.00	0.00	0.00	0.00
IK_50	Sidewalk	91.89	7.40	0.0301	0.0035	0.8221	0.60	0.00	77.04	208.42	1	4.50	4.50	12.51	37.54	25.03
IK_51	Shared	45.81	2.00	0.0274	0.0036	0.7978	0.25	0.00	139.44	139.57	0	3.00	4.00	8.73	13.10	10.91
IK_52	Sidewalk	40.16	2.00	0.0402	0.0036	0.7921	0.67	0.00	178.26	104.11	1	3.00	4.00	12.45	23.66	18.05
IK_53	Sidewalk	30.70	2.54	0.0327	0.0037	0.7824	0.75	0.00	197.55	68.68	1	5.00	4.50	8.14	17.92	13.03
IK_54	Shared	50.96	2.00	0.0218	0.0037	0.7831	0.83	0.00	156.65	133.32	0	3.00	4.00	8.83	14.72	11.77
IK_55	Shared	47.85	2.00	0.0404	0.0038	0.8061	0.67	0.00	145.61	166.11	0	3.00	4.00	7.31	8.36	7.84
IK_56	Sidewalk	47.59	2.61	0.0493	0.0038	0.8162	0.80	0.00	145.48	134.75	1	4.50	5.00	16.81	22.06	19.44
IK_57	Sidewalk	51.27	2.46	0.0363	0.0037	0.8154	1.00	0.00	91.98	47.74	1	4.50	4.50	5.85	13.65	9.75
IK_58	Sidewalk	65.44	3.01	0.0309	0.0038	0.8204	0.86	0.00	116.10	63.08	1	4.50	5.00	16.05	25.21	20.63
IK_59	Sidewalk	35.86	2.87	0.0272	0.0039	0.8272	1.00	0.00	65.46	112.82	1	5.00	5.00	22.31	13.94	18.13
IK_60	Sidewalk	24.16	8.55	0.0416	0.0040	0.8454	1.00	0.00	35.45	118.33	1	5.00	5.00	109.69	194.54	152.11
IK_61	Sidewalk	32.78	8.43	0.0409	0.0040	0.8369	1.00	0.00	6.98	89.86	1	5.00	5.00	83.89	117.45	93.81
IK_62	Pedestrian	31.37	4.20	0.0110	0.0041	0.7852	0.80	0.00	59.61	91.55	1	4.00	4.00	11.16	33.47	22.31
IK_63	Pedestrian	69.30	3.65	0.0171	0.0040	0.7966	0.75	0.00	55.00	82.51	1	4.00	4.00	3.61	10.10	6.85
IK_64	Sidewalk	29.61	2.67	0.0324	0.0038	0.8097	1.00	0.00	103.50	25.05	1	4.50	4.50	27.02	37.15	32.08
IK_65	Shared	61.09	2.00	0.0226	0.0038	0.7995	0.75	0.00	114.86	39.04	0	3.00	4.00	1.64	2.46	2.05
IK_66	Sidewalk	59.27	2.44	0.0396	0.0037	0.7967	0.50	0.00	106.58	193.45	1	4.00	4.00	10.12	5.91	8.01
IK_67	Shared	18.87	2.00	0.0483	0.0038	0.8024	0.00	1.00	173.49	210.11	0	3.00	3.50	2.65	7.95	5.30
IK_68	Shared	57.43	2.00	0.0616	0.0038	0.8085	0.17	0.67	146.42	294.26	0	3.00	4.00	10.45	5.22	7.84
IK_69	Sidewalk	37.89	2.36	0.0462	0.0038	0.8515	0.67	0.00	81.71	259.04	1	4.00	4.00	14.52	13.20	13.86
IK_70	Shared	52.59	2.00	0.0213	0.0037	0.8151	0.50	0.00	134.12	221.21	0	3.00	4.00	5.70	4.75	5.23
IK_71	Sidewalk	82.16	2.28	0.0259	0.0037	0.8287	0.67	0.00	12.10	289.10	1	4.00	4.50	11.56	9.13	10.35
IK_72	Sidewalk	42.39	2.55	0.0196	0.0039	0.8303	0.50	0.00	215.91	211.69	1	5.00	4.00	14.15	11.80	12.97
IK_73	Shared	24.92	2.00	0.0104	0.0037	0.7565	0.00	0.00	199.31	138.67	0	3.00	4.00	0.00	2.01	1.01
IK_74	Shared	32.91	2.00	0.0090	0.0037	0.7671	0.60	0.00	171.28	110.64	0	3.00	4.00	1.52	6.08	3.80
IK_75	Shared	68.86	2.00	0.0224	0.0039	0.8043	0.75	0.00	104.07	43.41	0	4.00	4.00	1.45	35.58	18.52
IK_76	Sidewalk	42.69	3.55	0.0410	0.0040	0.8147	1.00	0.00	108.30	21.34	1	4.00	4.50	36.31	43.34	39.82
IK_77	Shared	27.36	2.00	0.0284	0.0038	0.7977	0.83	0.00	165.08	78.12	0	4.00	4.00	9.14	12.79	10.96
IK_78	Sidewalk	37.32	2.24	0.0396	0.0039	0.8084	1.00	0.00	150.84	114.49	1	4.00	5.00	26.80	21.44	24.12
IK_79	Sidewalk	35.36	4.77	0.0228	0.0040	0.7750	0.83	0.00	23.67	17.68	1	4.00	5.00	41.01	35.35	38.18
IK_80	Sidewalk	33.18	4.80	0.0334	0.0041	0.8032	1.00	0.00	0.93	16.59	1	4.00	5.00	46.71	54.25	50.48
IK_81	Pedestrian	45.24	4.85	0.0215	0.0039	0.7677	0.20	0.00	27.04	62.39	1	3.00	4.00	3.32	3.32	3.32
IK_82	Sidewalk	49.58	2.76	0.0408	0.0039	0.7913	0.33	0.00	20.37	53.74	1	4.00	4.00	6.05	11.09	8.57
IK_83	Public Space	36.62	5.65	0.0302	0.0038	0.8097	0.67	0.00	34.08	50.16	1	5.00	5.00	35.50	12.29	23.89
IK_84	Sidewalk	163.96	2.76	0.0305	0.0038	0.8109	0.50	0.00	134.36	113.83	1	4.00	5.00	6.10	5.79	5.95
IK_85	Path	107.30	5.00	0.0480	0.0037	0.8087	1.00	0.00	87.88	88.86	1	5.00	5.00	28.42	28.42	28.42

Tokyo – Nakano

ID	Path Type	Length (m)	Width (m)	Betweenness	Closeness	Straightness	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Mod. Con.	Path Obst.	PDR (am)	PDR (midday)	PDR (average)
NK_2	SIDEWALK	185.91	2.85	0.0223	0.0037	0.7868	0.00	0.00	226.8	444.00	1	4.00	4.00	2.96	6.45	4.71
NK_3	SIDEWALK	38.59	1.55	0.0281	0.0037	0.8195	0.00	0.00	116.5	347.60	1	4.00	4.00	3.89	2.59	3.24
NK_4	PATH	52.56	2.50	0.0231	0.0037	0.8135	0.00	0.00	97.9	282.45	0	3.00	5.00	3.81	12.37	8.09
NK_5	SIDEWALK	57.91	5.21	0.0453	0.0037	0.7935	0.50	0.00	129.5	376.88	1	5.00	4.00	2.59	6.04	4.32
NK_6	PUB_SPACE	41.54	5.10	0.0305	0.0037	0.7950	0.60	0.00	79.1	435.72	1	4.00	5.00	2.41	3.61	3.01
NK_7	PUB_SPACE	29.96	5.50	0.0262	0.0037	0.8009	0.75	0.00	43.4	471.47	1	5.00	5.00	6.68	15.02	10.85
NK_8	SIDEWALK	31.16	4.50	0.0505	0.0039	0.8287	0.75	0.00	63.6	321.23	1	4.00	4.00	1.60	12.84	7.22
NK_9	SIDEWALK	35.70	6.05	0.0406	0.0038	0.8248	1.00	0.00	65.0	354.66	1	4.00	4.50	5.60	26.61	16.11
NK_10	SIDEWALK	140.16	3.46	0.0150	0.0039	0.8003	0.00	0.00	104.6	283.61	1	4.00	4.50	6.78	6.06	6.42
NK_11	SIDEWALK	71.92	5.95	0.0247	0.0039	0.8048	0.00	0.00	6.3	221.37	1	5.00	5.00	20.16	31.98	26.07
NK_12	SIDEWALK	95.80	3.16	0.0214	0.0039	0.7956	0.00	0.00	88.6	208.27	1	5.00	5.00	13.57	4.18	8.87
NK_13	SIDEWALK	49.24	3.23	0.0159	0.0040	0.7669	0.83	0.00	65.4	135.75	1	5.00	5.00	20.31	6.09	13.20
NK_14	SIDEWALK	29.24	3.81	0.0412	0.0042	0.8129	1.00	0.00	82.3	50.61	1	4.50	4.00	20.52	44.46	32.49
NK_15	SIDEWALK	20.24	2.97	0.0668	0.0044	0.8322	1.00	0.00	57.9	114.16	1	5.00	5.00	14.82	37.06	25.94
NK_16	SIDEWALK	16.59	3.25	0.0777	0.0044	0.8294	1.00	0.00	56.1	132.58	1	4.00	4.00	36.17	69.32	52.74
NK_17	SIDEWALK	41.44	2.85	0.0644	0.0043	0.8168	1.00	0.00	33.3	161.59	1	4.00	4.00	19.31	22.92	21.11
NK_18	PED_ALLEY	32.53	2.50	0.0843	0.0044	0.8377	1.00	0.00	64.1	110.89	1	5.00	4.00	9.22	46.11	27.67
NK_19	ARCADE	39.38	6.70	0.0434	0.0043	0.8284	1.00	0.00	65.5	131.88	1	5.00	5.00	92.69	151.09	121.89
NK_20	ARCADE	22.71	6.50	0.0494	0.0042	0.8226	1.00	0.00	51.5	162.92	1	5.00	5.00	35.23	132.10	83.66
NK_21	ARCADE	20.86	6.43	0.0498	0.0042	0.7994	1.00	0.00	50.6	184.71	1	5.00	5.00	38.35	62.32	46.74
NK_22	PEDESTRIAN	34.10	3.50	0.0465	0.0041	0.8063	0.86	0.00	45.3	212.19	1	4.50	4.00	4.40	10.26	7.33
NK_23	PEDESTRIAN	83.78	2.36	0.0262	0.0038	0.7935	0.60	0.00	127.3	325.12	1	3.50	3.00	4.18	8.36	6.27
NK_24	PEDESTRIAN	34.85	3.27	0.0255	0.0040	0.7861	0.80	0.00	126.6	260.78	1	4.00	4.00	1.43	4.30	2.87
NK_25	PEDESTRIAN	84.16	2.81	0.0634	0.0041	0.7936	0.95	0.00	103.1	237.22	1	4.00	4.00	2.97	17.82	10.40
NK_26	PEDESTRIAN	36.02	3.47	0.0505	0.0041	0.7846	1.00	0.00	113.2	213.54	1	4.00	4.00	2.78	11.10	6.94
NK_27	PEDESTRIAN	27.57	2.65	0.0577	0.0043	0.8089	0.80	0.00	115.3	125.67	1	4.00	4.00	3.63	5.44	4.53
NK_28	PEDESTRIAN	44.19	3.20	0.0494	0.0042	0.7990	0.88	0.00	151.2	118.15	1	4.00	4.00	9.05	7.92	8.49
NK_29	SIDEWALK	35.31	2.98	0.0355	0.0036	0.8184	1.00	0.00	57.3	89.97	1	5.00	4.00	19.82	25.49	22.66
NK_30	SIDEWALK	63.07	3.12	0.0310	0.0036	0.8227	1.00	0.00	71.2	135.47	1	4.00	4.00	19.82	42.81	31.31
NK_31	SIDEWALK	31.65	2.87	0.0174	0.0035	0.8134	1.00	0.00	118.5	182.79	1	3.50	4.00	15.80	23.70	19.75
NK_32	SIDEWALK	125.63	2.70	0.0304	0.0037	0.8250	0.93	0.00	155.6	261.43	1	4.00	4.00	10.75	11.94	11.34
NK_33	SIDEWALK	110.07	3.12	0.0300	0.0037	0.8276	0.94	0.00	151.8	216.04	1	4.00	4.50	18.62	14.54	16.58
NK_34	SIDEWALK	62.99	3.24	0.0444	0.0036	0.8287	1.00	0.00	54.6	118.83	1	4.00	4.50	42.86	26.99	34.93
NK_35	SIDEWALK	46.04	3.28	0.0240	0.0036	0.7958	0.80	0.00	3.7	97.75	1	4.50	4.50	7.60	35.84	21.72
NK_36	PEDESTRIAN	82.30	5.24	0.0331	0.0035	0.7879	0.94	0.00	60.4	120.80	1	5.00	5.00	50.43	49.82	38.88
NK_37	SHARED	95.08	2.00	0.0310	0.0036	0.7988	0.88	0.00	125.5	209.49	0	3.50	4.00	25.24	17.35	21.30
NK_38	SIDEWALK	41.21	2.75	0.0357	0.0039	0.8360	0.80	0.00	67.7	308.49	1	3.50	3.50	1.21	8.49	4.85
NK_39	PUB_SPACE	49.53	1.50	0.0207	0.0039	0.7874	0.00	0.00	96.1	364.64	1	4.00	3.00	1.01	0.01	0.51
NK_40	SIDEWALK	57.47	1.65	0.0392	0.0038	0.7906	0.00	0.00	39.9	387.11	1	4.50	3.00	0.87	4.35	2.61
NK_41	SHARED	74.87	2.00	0.0322	0.0036	0.7773	0.00	1.00	137.6	425.87	0	3.00	4.00	3.34	2.00	2.67
NK_42	STEPS_RAMP	44.00	2.00	0.0263	0.0034	0.7435	0.00	0.83	195.8	323.40	0	3.00	4.00	3.41	1.14	2.27
NK_43	SHARED	121.46	2.00	0.0339	0.0035	0.7598	0.00	0.96	234.5	406.14	0	3.00	4.00	1.23	1.65	1.44
NK_44	SHARED	126.34	2.00	0.0541	0.0036	0.7995	0.13	0.50	344.5	361.26	0	3.00	4.00	4.75	3.96	4.35
NK_45	SIDEWALK	32.01	2.41	0.0617	0.0037	0.8448	1.00	0.00	265.4	282.09	1	4.50	5.00	29.68	14.06	21.87
NK_46	SHARED	64.30	2.00	0.0406	0.0036	0.7525	0.00	0.80	281.5	298.23	0	3.00	4.00	0.78	0.01	0.39

ID	Path Type	Length (m)	Width (m)	Betweenness	Closeness	Straightness	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Mod. Con.	Path Obst.	PDR (am)	PDR (midday)	PDR (average)
NK_47	SIDEWALK	32.02	1.63	0.0262	0.0037	0.8478	0.60	0.20	267.1	283.78	1	4.00	4.00	4.68	0.02	2.35
NK_48	SIDEWALK	75.89	2.02	0.0164	0.0036	0.8379	0.67	0.11	213.1	229.83	1	3.00	4.00	4.61	3.29	3.95
NK_49	SIDEWALK	145.05	3.07	0.0345	0.0035	0.7891	0.86	0.14	95.0	111.76	1	5.00	5.00	32.40	21.72	27.06
NK_50	SHARED	109.25	2.00	0.0399	0.0036	0.7919	0.50	0.17	152.9	216.57	0	3.00	4.00	13.73	6.41	10.07
NK_51	SHARED	51.02	2.00	0.0369	0.0037	0.8102	0.75	0.13	127.1	327.54	0	3.00	4.00	8.82	9.80	9.31
NK_52	SHARED	55.76	2.00	0.0089	0.0033	0.6379	0.00	1.00	285.0	452.49	0	3.00	4.00	0.01	1.79	0.90
NK_53	SHARED	53.51	2.00	0.0350	0.0036	0.6978	0.00	0.86	421.8	423.79	0	3.00	4.00	2.80	1.87	2.34
NK_54	SHARED	53.12	2.00	0.0233	0.0036	0.7902	0.00	1.00	400.4	402.34	0	3.00	4.00	0.01	3.77	1.89
NK_55	SHARED	77.45	2.00	0.0230	0.0035	0.7945	0.25	0.75	335.1	337.06	0	3.00	4.00	7.75	1.94	4.84
NK_56	SHARED	65.81	2.00	0.0357	0.0038	0.7447	0.00	1.00	373.4	375.40	0	3.00	4.00	0.01	2.28	1.14
NK_57	SHARED	56.53	2.00	0.0303	0.0038	0.7372	0.00	1.00	392.6	394.61	0	3.00	4.00	0.88	0.01	0.45
NK_58	SHARED	21.14	2.00	0.0577	0.0037	0.7759	0.80	0.20	353.8	355.77	0	3.00	4.00	2.37	9.46	5.91
NK_59	SHARED	34.80	2.00	0.0473	0.0036	0.7980	0.60	0.20	258.2	283.49	0	3.00	3.50	4.31	4.31	4.31
NK_60	SHARED	55.24	2.00	0.0420	0.0036	0.7851	0.77	0.00	236.5	238.47	0	3.00	4.00	9.05	7.24	8.15
NK_61	SHARED	45.00	2.00	0.0453	0.0035	0.7527	0.00	0.75	231.4	233.36	0	3.00	4.00	6.67	4.44	5.56
NK_62	SHARED	30.52	2.00	0.0243	0.0035	0.7378	0.33	0.67	224.2	226.20	0	2.50	4.00	6.55	4.91	5.73
NK_63	PEDESTRIAN	52.02	3.23	0.0303	0.0035	0.7366	0.67	0.00	148.5	150.47	1	4.00	4.00	4.81	2.88	3.84
NK_64	PEDESTRIAN	52.15	3.50	0.0373	0.0036	0.7825	0.91	0.00	96.4	98.39	1	4.50	4.50	10.55	13.42	11.98
NK_65	SHARED	73.20	2.00	0.0297	0.0035	0.7501	0.60	0.00	274.2	203.91	0	3.00	4.00	6.15	12.30	9.22
NK_66	SHARED	91.33	2.00	0.0251	0.0035	0.7468	0.50	0.25	392.5	322.19	0	3.00	4.00	6.58	3.28	4.93
NK_67	SHARED	36.72	2.00	0.0380	0.0038	0.8054	0.00	1.00	444.7	382.38	0	3.00	5.00	8.17	6.81	7.49
NK_68	SHARED	53.36	2.00	0.0259	0.0037	0.7919	0.21	0.71	388.9	323.89	0	3.00	4.00	3.75	5.62	4.69
NK_69	SHARED	91.91	2.00	0.0347	0.0037	0.7865	0.21	0.43	316.3	251.25	0	3.00	4.00	9.25	6.53	7.89
NK_70	SHARED	87.94	2.00	0.0435	0.0039	0.7952	0.56	0.33	226.3	184.95	0	3.00	4.00	6.25	9.67	7.96
NK_71	PEDESTRIAN	28.08	3.57	0.0840	0.0042	0.8168	0.92	0.00	171.3	191.41	1	4.50	5.00	21.37	26.71	24.04
NK_72	PED_ALLEY	42.34	2.00	0.0424	0.0038	0.7763	0.00	1.00	276.5	285.89	1	3.00	4.00	2.36	4.72	3.54
NK_73	SHARED	26.26	2.00	0.0151	0.0036	0.7515	0.00	1.00	326.4	366.91	0	3.00	4.00	0.02	0.02	0.02
NK_74	SHARED	44.61	2.00	0.0520	0.0036	0.7842	0.00	0.88	360.9	383.23	0	3.00	4.00	3.36	1.12	2.24
NK_75	SHARED	40.61	2.00	0.0326	0.0035	0.7566	0.00	0.80	318.3	425.84	0	3.00	4.00	1.23	2.46	1.85
NK_76	SHARED	61.21	2.00	0.0237	0.0037	0.7457	0.29	0.29	235.7	365.08	0	3.00	4.00	1.63	13.89	7.76
NK_77	PEDESTRIAN	56.94	2.76	0.0169	0.0037	0.7929	0.91	0.09	193.0	390.81	1	3.00	4.00	2.63	4.39	3.51
NK_78	PEDESTRIAN	29.88	2.89	0.0292	0.0039	0.7906	0.93	0.07	207.3	347.40	1	4.00	4.00	6.69	6.69	6.69
NK_79	SIDEWALK	27.97	3.50	0.0395	0.0042	0.8189	1.00	0.00	53.7	77.76	1	4.50	5.00	35.75	50.05	42.90
NK_80	ARCADE	31.17	6.55	0.0531	0.0040	0.8109	1.00	0.00	93.6	227.76	1	5.00	5.00	51.33	68.98	60.15
NK_81	ARCADE	20.08	6.44	0.0585	0.0040	0.8118	1.00	0.00	115.3	253.39	1	5.00	5.00	57.27	67.23	62.25

Tokyo – Akasaka

ID	Path Type	Length (m)	Width (m)	Betweenness	Closeness	Straightness	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Mod. Con.	Path Obst.	PDR (am)	PDR (midday)	PDR (average)
AK_1	Sidewalk	72.99	3.56	0.0210	0.0040	0.7742	0.90	0.00	36.50	17.72	1	5.00	4.00	6.85	17.81	12.33
AK_2	Sidewalk	28.18	2.63	0.0284	0.0039	0.7766	0.83	0.00	14.09	32.87	1	4.00	4.50	3.55	8.87	6.21
AK_3	Sidewalk	64.57	3.10	0.0359	0.0037	0.7797	0.85	0.08	32.28	79.24	1	4.00	4.00	3.10	13.16	8.13
AK_4	Sidewalk	21.77	2.67	0.0433	0.0037	0.7853	0.75	0.00	75.45	96.39	1	4.50	4.50	4.59	11.48	8.04
AK_5	Sidewalk	51.29	2.25	0.0227	0.0036	0.8080	0.67	0.33	155.07	59.36	1	4.00	4.50	1.95	6.82	4.39
AK_6	Sidewalk	53.44	2.34	0.0279	0.0037	0.7994	0.80	0.00	102.70	111.73	1	4.00	4.00	1.87	15.91	8.89
AK_7	Sidewalk	61.73	2.62	0.0350	0.0038	0.7923	0.86	0.00	67.34	93.70	1	4.00	4.00	12.15	8.91	10.53
AK_8	Sidewalk	32.11	2.70	0.0407	0.0039	0.8179	1.00	0.00	20.42	46.78	1	4.50	4.50	14.01	23.36	18.69
AK_9	Shared	22.91	2.00	0.0086	0.0038	0.7233	0.00	1.00	75.04	101.40	0	3.00	4.00	0.00	2.18	1.10
AK_10	Pedestrian Alley	32.00	1.50	0.0185	0.0039	0.7440	0.00	0.50	50.23	76.58	0	2.00	3.00	0.00	1.56	0.79
AK_11	Pedestrian Alley	33.59	2.00	0.0249	0.0040	0.7571	0.33	0.33	51.02	77.38	0	4.00	4.00	2.98	7.44	5.21
AK_12	Path	21.48	1.50	0.0114	0.0041	0.7616	0.00	0.00	34.31	120.00	1	5.00	5.00	2.33	4.66	3.49
AK_13	Sidewalk	36.06	3.05	0.0611	0.0041	0.8139	1.00	0.00	21.39	154.75	1	4.50	4.50	9.71	18.03	13.87
AK_14	Sidewalk	41.72	3.10	0.0647	0.0040	0.8565	0.86	0.00	105.53	131.75	1	5.00	4.50	8.39	22.77	15.58
AK_15	Sidewalk	26.35	2.07	0.0351	0.0039	0.8292	0.50	0.25	139.57	124.07	1	4.00	4.00	3.80	9.49	6.64
AK_16	Shared	127.92	2.00	0.0360	0.0037	0.8229	0.45	0.09	220.97	147.25	0	3.00	4.00	2.74	8.21	5.47
AK_17	Sidewalk	41.43	5.07	0.0252	0.0035	0.7933	0.33	0.33	140.51	191.66	1	5.00	5.00	8.45	26.55	17.50
AK_18	Sidewalk	49.60	3.05	0.0158	0.0035	0.7895	0.50	0.00	240.01	167.53	1	5.00	4.00	7.06	9.07	8.06
AK_19	Shared	101.13	2.00	0.0202	0.0036	0.7772	0.63	0.13	164.64	92.16	0	3.00	2.00	2.97	2.97	2.97
AK_20	Sidewalk	100.92	2.12	0.0198	0.0036	0.7775	0.64	0.00	171.62	99.14	1	4.50	4.00	5.45	5.45	5.45
AK_21	Sidewalk	226.41	3.93	0.0134	0.0037	0.7861	0.22	0.67	196.77	226.98	1	4.00	4.00	3.09	5.52	4.31
AK_22	Pedestrian	34.21	6.60	0.0369	0.0037	0.7870	1.00	0.00	199.85	267.79	1	5.00	4.00	4.38	16.08	10.23
AK_23	Sidewalk	73.24	2.59	0.0451	0.0039	0.8132	0.86	0.00	161.93	293.04	1	4.50	4.00	8.87	17.75	13.31
AK_24	Sidewalk	39.39	3.50	0.0614	0.0042	0.8351	0.00	0.00	117.42	236.73	1	4.00	4.00	5.08	5.08	5.08
AK_25	Shared	87.37	2.00	0.0057	0.0036	0.7578	0.00	0.88	288.04	346.39	0	3.00	4.00	0.57	0.57	0.57
AK_26	Path	98.44	1.50	0.0058	0.0036	0.7762	0.00	1.00	376.27	296.33	1	4.00	4.00	0.00	0.00	0.00
AK_27	Shared	28.71	2.00	0.0484	0.0036	0.7866	0.33	0.33	366.25	232.42	0	3.00	4.00	3.48	1.74	2.61
AK_28	Shared	46.71	2.00	0.0347	0.0035	0.7852	0.67	0.00	340.66	250.06	0	3.50	4.00	6.42	4.28	5.35
AK_29	Sidewalk	39.36	1.55	0.0422	0.0037	0.8077	0.00	0.00	338.85	274.68	1	4.00	4.00	1.27	0.00	0.64
AK_30	Sidewalk	44.12	1.61	0.0409	0.0037	0.7866	0.00	0.00	380.59	316.42	1	4.00	4.00	0.00	2.27	1.14
AK_31	Shared	81.82	2.00	0.0615	0.0038	0.7868	0.00	0.83	435.78	367.22	0	3.00	4.00	3.67	1.83	2.75
AK_32	Shared	42.06	2.00	0.0540	0.0037	0.7767	0.00	0.83	358.83	277.55	0	3.00	2.00	1.19	0.00	0.60
AK_33	Sidewalk	53.40	2.55	0.0408	0.0036	0.7679	0.00	0.50	356.22	283.22	1	4.00	4.00	1.87	6.55	4.21
AK_34	Sidewalk	36.05	2.31	0.0225	0.0035	0.7589	0.00	0.00	317.53	316.52	1	4.50	4.00	5.55	6.93	6.24
AK_35	Public Space	51.50	20.00	0.0191	0.0039	0.7580	0.00	0.00	267.49	370.32	1	5.00	5.00	1.94	8.74	5.34
AK_36	Sidewalk	28.31	1.56	0.0711	0.0040	0.8316	0.67	0.33	171.60	274.44	1	5.00	5.00	15.90	1.77	8.83
AK_37	Pedestrian Alley	37.69	1.50	0.0061	0.0036	0.7681	0.00	1.00	252.97	355.81	0	3.00	4.00	1.33	0.00	0.67
AK_38	Path	61.39	1.50	0.0513	0.0042	0.8082	0.00	0.00	72.25	192.07	1	5.00	4.00	3.26	0.81	2.04
AK_39	Shared	60.59	2.00	0.0651	0.0041	0.8153	0.50	0.00	141.43	204.85	0	3.50	4.00	11.55	4.13	7.84
AK_40	Sidewalk	59.91	2.21	0.0255	0.0036	0.7808	0.33	0.00	169.76	176.13	1	4.50	5.00	10.85	10.02	10.43
AK_41	Shared	64.93	2.00	0.0366	0.0035	0.7897	0.17	0.83	246.05	164.77	0	3.50	4.00	4.62	4.62	4.62
AK_42	Shared	60.98	2.00	0.0201	0.0035	0.7890	0.33	0.67	290.65	118.80	0	3.00	4.00	0.82	5.74	3.28
AK_43	Sidewalk	72.79	1.87	0.0236	0.0035	0.8125	0.25	0.50	274.32	102.47	1	3.00	3.00	1.37	6.18	3.78
AK_44	Sidewalk	41.12	2.01	0.0406	0.0038	0.7778	0.67	0.00	283.29	111.44	1	5.00	4.00	1.22	4.86	3.04
AK_45	Sidewalk	141.17	2.05	0.0285	0.0036	0.7761	0.67	0.00	286.76	114.91	1	4.00	5.00	6.02	6.73	6.38

ID	Path Type	Length (m)	Width (m)	Betweenness	Closeness	Straightness	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Mod. Con.	Path Obst.	PDR (am)	PDR (midday)	PDR (average)
AK_46	Sidewalk	37.89	2.31	0.0428	0.0037	0.7563	0.00	0.00	270.60	213.60	1	5.00	5.00	6.60	9.24	7.92
AK_47	Sidewalk	93.89	2.60	0.0694	0.0038	0.7876	0.75	0.00	262.11	288.43	1	4.00	4.00	6.39	6.92	6.66
AK_48	Public Space	38.43	20.00	0.0514	0.0041	0.8045	0.80	0.00	282.40	325.86	1	5.00	5.00	0.00	37.73	18.87
AK_49	Steps / Ramp	34.13	3.61	0.0596	0.0042	0.7913	0.00	0.00	324.07	304.31	1	5.00	4.00	1.46	1.46	1.46
AK_50	Pedestrian Alley	35.61	1.50	0.0616	0.0043	0.7925	0.00	1.00	358.94	269.44	0	3.00	4.00	4.21	0.00	2.11
AK_51	Pedestrian Alley	33.58	1.50	0.0313	0.0039	0.7214	0.00	1.00	361.02	277.65	0	3.00	4.00	2.98	1.49	2.23
AK_52	Shared	84.51	2.00	0.0354	0.0038	0.7502	0.30	0.70	337.27	303.12	0	3.00	4.00	5.92	10.06	7.99
AK_53	Shared	61.67	2.00	0.0267	0.0035	0.7207	0.00	0.75	361.74	288.42	0	3.00	4.00	1.62	2.43	2.03
AK_54	Shared	67.27	2.00	0.0268	0.0035	0.7084	0.00	0.71	420.31	240.43	0	3.00	4.00	2.23	5.20	3.72
AK_55	Shared	29.01	2.00	0.0531	0.0040	0.7747	0.00	1.00	280.02	372.77	0	4.00	4.50	3.45	13.79	8.62
AK_56	Shared	23.63	2.50	0.0801	0.0039	0.7690	0.75	0.25	230.91	389.61	0	3.50	4.50	10.58	14.81	12.70
AK_57	Shared	38.86	2.00	0.0304	0.0037	0.7369	0.00	1.00	283.71	375.12	0	3.00	4.00	1.29	2.57	1.93
AK_58	Pedestrian Alley	60.21	1.50	0.0237	0.0036	0.7269	0.00	0.83	333.24	325.59	0	3.00	3.00	1.66	4.15	2.91
AK_59	Shared	109.79	2.50	0.0368	0.0036	0.7909	0.73	0.07	285.00	308.47	0	3.00	4.00	12.30	35.07	23.68
AK_60	Sidewalk	43.20	3.70	0.0396	0.0038	0.8249	1.00	0.00	243.12	306.30	1	5.00	5.00	9.26	34.72	21.99
AK_61	Sidewalk	68.46	3.04	0.0310	0.0037	0.8308	0.88	0.00	226.19	346.69	1	5.00	5.00	9.49	22.64	16.07
AK_62	Public Space	31.37	2.00	0.0350	0.0038	0.7569	0.00	0.00	123.08	283.20	1	4.00	4.00	1.59	4.78	3.19
AK_63	Sidewalk	87.63	2.03	0.0641	0.0041	0.7977	0.60	0.00	68.19	174.55	1	5.00	5.00	2.28	7.42	4.85
AK_64	Steps / Ramp	59.84	9.27	0.0220	0.0041	0.7892	0.67	0.00	39.70	209.52	1	5.00	5.00	8.36	20.05	14.20
AK_65	Sidewalk	71.35	2.39	0.0409	0.0038	0.7136	0.67	0.00	111.89	275.04	1	5.00	5.00	27.33	16.82	22.07
AK_66	Sidewalk	50.26	2.08	0.0512	0.0040	0.7610	0.10	0.00	151.09	309.79	1	5.00	5.00	11.94	14.92	13.43
AK_67	Sidewalk	35.69	2.14	0.0685	0.0041	0.7789	0.50	0.00	99.33	258.03	1	5.00	5.00	11.21	16.81	14.01
AK_68	Sidewalk	39.02	5.48	0.0420	0.0041	0.8482	1.00	0.00	28.42	187.06	1	5.00	5.00	23.07	79.45	43.57
AK_69	Sidewalk	16.07	5.44	0.0409	0.0042	0.8279	1.00	0.00	31.43	159.52	1	4.00	5.00	9.33	62.23	35.78
AK_70	Public Space	58.20	12.25	0.0339	0.0041	0.8122	1.00	0.00	68.85	150.14	1	5.00	5.00	8.59	15.46	9.88
AK_71	Pedestrian Alley	57.65	2.00	0.0258	0.0040	0.8131	0.78	0.00	52.73	206.79	0	3.00	4.00	6.07	5.20	5.64
AK_72	Sidewalk	38.06	2.55	0.0292	0.0040	0.8230	1.00	0.00	42.93	240.59	1	5.00	5.00	10.51	28.90	19.71
AK_73	Pedestrian	30.33	7.11	0.0400	0.0038	0.8432	1.00	0.00	128.73	214.82	1	4.50	4.00	41.21	59.35	38.74
AK_74	Pedestrian	43.23	6.89	0.0465	0.0037	0.8339	1.00	0.00	183.46	151.92	1	5.00	4.00	16.19	34.70	25.45
AK_75	Pedestrian	75.35	7.01	0.0303	0.0036	0.8106	0.92	0.00	191.76	267.09	1	4.50	4.50	9.95	50.43	30.19
AK_76	Pedestrian Alley	35.26	2.25	0.0363	0.0036	0.8018	0.00	0.00	68.41	215.68	1	5.00	5.00	9.93	34.03	21.98
AK_77	Sidewalk	26.44	1.55	0.0338	0.0037	0.8385	0.00	0.00	174.74	100.52	1	5.00	4.00	3.78	11.35	7.56
AK_78	Sidewalk	62.92	5.85	0.0434	0.0037	0.8065	0.71	0.00	200.49	48.34	1	5.00	5.00	11.92	27.02	19.47
AK_79	Sidewalk	77.27	2.21	0.0293	0.0038	0.7959	0.00	0.00	236.11	159.97	1	2.00	2.00	1.29	5.18	3.24
AK_80	Sidewalk	52.67	2.11	0.0153	0.0037	0.7785	0.00	0.00	144.88	173.93	1	5.00	5.00	1.90	15.19	8.54
AK_81	Public Space	51.73	20.00	0.0283	0.0038	0.8157	0.75	0.00	152.64	149.22	1	5.00	5.00	2.90	48.33	25.61
AK_82	Sidewalk	34.99	5.23	0.0182	0.0037	0.8132	0.70	0.00	164.27	149.38	1	4.50	5.00	5.72	22.86	14.29
AK_83	Sidewalk	51.68	5.18	0.0204	0.0037	0.7999	0.70	0.00	120.94	192.71	1	4.50	5.00	6.77	12.58	9.67
AK_84	Pedestrian Alley	44.94	1.50	0.0156	0.0035	0.7938	0.33	0.33	183.70	193.41	0	3.00	4.00	2.23	4.45	3.34

Appendix N: Bangkok – Correlations

Sukhumvit

	BC	CC	SC	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Path Width	Modal Conflict	Path Obs.	Ped Den (avg.)
BC	1	.591**	.238*	-.012	-.041	.116	.133	.023	.063	-.117	.020	-.145
CC		1	.205	.146	-.163	.005	-.226	.289*	.202	.172	.248*	.205
SC			1	.016	-.147	-.054	.230*	.358**	.007	-.041	-.272*	-.020
Retail (prop.)				1	-.860**	-.497**	-.671**	.565**	.492**	.506**	.383**	.723**
Residential (prop.)					1	.609**	.652**	-.663**	-.418**	-.470**	-.318**	-.708**
Bus (prox.)						1	.619**	-.429**	-.534**	-.429**	-.405**	-.587**
Metro (prox.)							1	-.486**	-.512**	-.527**	-.526**	-.742**
Path Exclusivity								1	.377**	.598**	.232*	.508**
Path Width									1	.426**	.572**	.568**
Modal Conflict										1	.671**	.664**
Path Obstructions											1	.630**
Ped Den (avg.)												1

** $p < 0.05$; ** $p < 0.01$*

Sala Daeng

	BC	CC	SC	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Path Width	Modal Conflict	Path Obs.	Ped Den (avg.)
BC	1	.599**	.522**	.206	-.179	.230*	.189	.358**	-.010	.261*	.235*	.309**
CC		1	.361**	.004	.076	.392**	.106	.108	-.052	-.027	.198	-.067
SC			1	.156	-.509**	-.117	.123	.501**	.141	.455**	.342**	.401**
Retail (prop.)				1	-.360**	-.250*	-.282**	.072	-.178	.249*	.381**	.698**
Residential (prop.)					1	.497**	.335**	-.422**	-.122	-.490**	-.355**	-.612**
Bus (prox.)						1	.637**	-.273*	-.121	-.355**	-.241*	-.376**
Metro (prox.)							1	-.148	-.310**	-.239*	-.325**	-.308**
Path Exclusivity								1	.202	.727**	.355**	.418**
Path Width									1	.208	.263*	.221*
Modal Conflict										1	.455**	.550**
Path Obstructions											1	.580**
Ped Den (avg.)												1

** $p < 0.05$; ** $p < 0.01$*

Chong Nonsi

	BC	CC	SC	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Path Width	Modal Conflict	Path Obs.	Ped Den (avg.)
BC	1	.608**	.310**	.285*	-.165	-.071	-.346**	.175	.246*	.196	.201	.302**
CC		1	.091	.275*	-.276*	-.183	-.412**	.331**	.421**	.380**	.314**	.259*
SC			1	.294**	-.549**	-.413**	-.141	.420**	.200	.407**	.256*	.385**
Retail (prop.)				1	-.492**	-.373**	-.526**	.258*	.362**	.368**	.476**	.786**
Residential (prop.)					1	.522**	.261*	-.511**	-.326**	-.444**	-.279*	-.606**
Bus (prox.)						1	.434**	-.337**	-.456**	-.365**	-.451**	-.363**
Metro (prox.)							1	-.113	-.303**	-.175	-.317**	-.393**
Path Exclusivity								1	.395**	.801**	.383**	.387**
Path Width									1	.425**	.506**	.473**
Modal Conflict										1	.680**	.416**
Path Obstructions											1	.492**
Ped Den (avg.)												1

** $p < 0.05$; ** $p < 0.01$*

Bangkok (Consolidated)

	BC	CC	SC	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Path Width	Modal Conflict	Path Obs.	Ped Den (avg.)
BC	1	.582**	.377**	.169**	-.092	.129*	.034	.193**	.037	.092	.121	.171**
CC		1	.245**	.171**	-.126	.092	-.211**	.258**	.100	.189**	.229**	.116
SC			1	.187**	-.336**	-.122	.066	.432**	.112	.271**	.082	.278**
Retail (prop.)				1	-.524**	-.317**	-.466**	.268**	.029	.340**	.381**	.715**
Residential (prop.)					1	.536**	.470**	-.522**	-.214**	-.482**	-.342**	-.600**
Bus (prox.)						1	.539**	-.325**	-.232**	-.353**	-.359**	-.412**
Metro (prox.)							1	-.258**	-.314**	-.342**	-.416**	-.446**
Path Exclusivity								1	.248**	.699**	.315**	.422**
Path Width									1	.279**	.341**	.306**
Modal Conflict										1	.620**	.518**
Path Obstructions											1	.550**
Ped Den (avg.)												1

** $p < 0.05$; ** $p < 0.01$*

Appendix O: Manila – Correlations

Carriedo

	BC	CC	SC	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Path Width	Modal Conflict	Path Obs.	Ped Den (avg.)
BC	1	.182	.087	.499**	-.300**	.050	.188	.211	.367**	-.006	.119	.428**
CC		1	.008	.004	-.008	-.129	.063	.106	-.327**	-.076	-.142	-.133
SC			1	.104	-.048	.346**	-.334**	.034	.090	.014	.030	-.035
Retail (prop.)				1	-.520**	.171	-.214	.189	.469**	.301**	.364**	.806**
Residential (prop.)					1	-.009	.225*	-.317**	-.234*	-.087	-.207	-.512**
Bus (prox.)						1	.050	-.122	.045	-.247*	-.142	.021
Metro (prox.)							1	-.160	-.234*	-.306**	-.268*	-.271*
Path Exclusivity								1	.246*	.426**	.317**	.341**
Path Width									1	.339**	.442**	.689**
Modal Conflict										1	.811**	.488**
Path Obstructions											1	.581**
Ped Den (avg.)												1

* $p < 0.05$; ** $p < 0.01$

Pedro Gil

	BC	CC	SC	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Path Width	Modal Conflict	Path Obs.	Ped Den (avg.)
BC	1	.559**	-.206	.420**	-.312**	-.373**	-.457**	.056	.437**	.506**	.551**	.429**
CC		1	.039	.273*	-.137	.031	-.039	.066	.106	.357**	.348**	.300*
SC			1	-.157	.050	.319**	.360**	-.160	-.485**	-.211	-.242*	-.131
Retail (prop.)				1	-.370**	-.501**	-.659**	.126	.649**	.455**	.528**	.822**
Residential (prop.)					1	.377**	.351**	-.309**	-.386**	-.406**	-.468**	-.458**
Bus (prox.)						1	.805**	-.025	-.614**	-.434**	-.514**	-.636**
Metro (prox.)							1	-.109	-.699**	-.487**	-.603**	-.693**
Path Exclusivity								1	.163	.256*	.301*	.137
Path Width									1	.435**	.582**	.689**
Modal Conflict										1	.850**	.635**
Path Obstructions											1	.649**
Ped Den (avg.)												1

* $p < 0.05$; ** $p < 0.01$

Roosevelt

	BC	CC	SC	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Path Width	Modal Conflict	Path Obs.	Ped Den (avg.)
BC	1	.690**	.165	.150	.094	.168	.114	.141	-.256*	.173	.179	-.036
CC		1	.240*	.132	-.001	.172	.079	.087	-.210	.217	.239*	-.022
SC			1	-.322**	.333**	.367**	.518**	.083	-.284*	-.077	-.138	-.387**
Retail (prop.)				1	-.826**	-.589**	-.596**	.052	.583**	.555**	.515**	.914**
Residential (prop.)					1	.617**	.620**	-.021	-.522**	-.431**	-.413**	-.829**
Bus (prox.)						1	.679**	-.102	-.563**	-.362**	-.301**	-.667**
Metro (prox.)							1	-.033	-.552**	-.450**	-.536**	-.686**
Path Exclusivity								1	-.178	.076	-.066	-.010
Path Width									1	.379**	.480**	.701**
Modal Conflict										1	.744**	.541**
Path Obstructions											1	.566**
Ped Den (avg.)												1

** $p < 0.05$; ** $p < 0.01$*

Manila (Consolidated)

	BC	CC	SC	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Path Width	Modal Conflict	Path Obs.	Ped Den (avg.)
BC	1	.440**	.058	.266**	-.032	-.033	-.028	.160*	.170**	.207**	.238**	.165*
CC		1	.066	.025	.154*	.093	.124	.069	-.286**	.084	.051	-.125
SC			1	-.247**	.153*	.293**	.244**	.103	-.138*	-.120	-.181**	-.245**
Retail (prop.)				1	-.637**	-.365**	-.558**	.033	.514**	.464**	.518**	.869**
Residential (prop.)					1	.459**	.503**	-.074	-.355**	-.342**	-.366**	-.739**
Bus (prox.)						1	.541**	-.096	-.200**	-.353**	-.309**	-.495**
Metro (prox.)							1	-.057	-.411**	-.437**	-.495**	-.625**
Path Exclusivity								1	.088	.219**	.112	.071
Path Width									1	.345**	.467**	.614**
Modal Conflict										1	.803**	.546**
Path Obstructions											1	.601**
Ped Den (avg.)												1

** $p < 0.05$; ** $p < 0.01$*

Appendix P: Osaka – Correlations

Namba

	BC	CC	SC	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Path Width	Modal Conflict	Path Obs.	Ped Den (avg.)
BC	1	.306**	.539**	.309**	-.047	-.159	-.289**	.161	.241*	.194	.207*	.435**
CC		1	.320**	.298**	.004	.143	-.055	.079	.003	.144	.080	.073
SC			1	.456**	-.115	.017	-.174	.492**	.462**	.463**	.387**	.546**
Retail (prop.)				1	-.324**	-.283**	-.318**	.182	.475**	.379**	.211*	.634**
Residential (prop.)					1	.260**	.384**	-.306**	-.281**	-.334**	-.336**	-.460**
Bus (prox.)						1	.651**	-.020	-.139	-.109	-.138	-.350**
Metro (prox.)							1	-.118	-.332**	-.267**	-.321**	-.406**
Path Exclusivity								1	.435**	.678**	.494**	.378**
Path Width									1	.723**	.619**	.629**
Modal Conflict										1	.722**	.614**
Path Obstructions											1	.586**
Ped Den (avg.)												1

** $p < 0.05$; ** $p < 0.01$*

Tsuruhashi

	BC	CC	SC	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Path Width	Modal Conflict	Path Obs.	Ped Den (avg.)
BC	1	.483**	.522**	.402**	-.289**	-.214*	-.180	.233*	.173	.271**	.200*	.450**
CC		1	.094	.572**	-.307**	-.381**	-.599**	.300**	.067	.371**	.203*	.413**
SC			1	.402**	-.465**	-.162	.067	.405**	.371**	.333**	.386**	.409**
Retail (prop.)				1	-.810**	-.550**	-.590**	.584**	.362**	.666**	.596**	.738**
Residential (prop.)					1	.523**	.437**	-.527**	-.463**	-.546**	-.565**	-.736**
Bus (prox.)						1	.600**	-.315**	-.101	-.304**	-.210*	-.463**
Metro (prox.)							1	-.295**	-.137	-.414**	-.328**	-.540**
Path Exclusivity								1	.449**	.764**	.462**	.386**
Path Width									1	.534**	.510**	.358**
Modal Conflict										1	.666**	.509**
Path Obstructions											1	.545**
Ped Den (avg.)												1

** $p < 0.05$; ** $p < 0.01$*

Tanimachi-Yonchome

	BC	CC	SC	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Path Width	Modal Conflict	Path Obs.	Ped Den (avg.)
BC	1	.426**	.172	.257*	-.323**	-.150	-.382**	.304**	.301**	.289*	.153	.409**
CC		1	.174	-.164	-.135	-.181	-.004	.206	.155	.216	.034	.044
SC			1	.269*	-.466**	.231*	.271*	.512**	.125	.354**	.186	.372**
Retail (prop.)				1	-.342**	.240*	-.348**	.314**	.379**	.268*	.211	.553**
Residential (prop.)					1	.125	.184	-.472**	-.458**	-.492**	-.551**	-.601**
Bus (prox.)						1	.337**	-.139	-.230*	-.241*	-.383**	-.148
Metro (prox.)							1	-.059	-.425**	-.130	-.215	-.363**
Path Exclusivity								1	.415**	.755**	.409**	.507**
Path Width									1	.542**	.454**	.655**
Modal Conflict										1	.563**	.633**
Path Obstructions											1	.581**
Ped Den (avg.)												1

** $p < 0.05$; ** $p < 0.01$*

Osaka (Consolidated)

	BC	CC	SC	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Path Width	Modal Conflict	Path Obs.	Ped Den (avg.)
BC	1	.382**	.418**	.245**	-.171**	.054	-.189**	.220**	.227**	.232**	.211**	.403**
CC		1	.186**	.262**	-.237**	-.024	-.297**	.243**	.102	.278**	.148*	.219**
SC			1	.315**	-.285**	.153*	.099	.429**	.284**	.366**	.317**	.418**
Retail (prop.)				1	-.554**	-.213**	-.502**	.375**	.440**	.465**	.328**	.647**
Residential (prop.)					1	.066	.464**	-.523**	-.439**	-.483**	-.504**	-.583**
Bus (prox.)						1	.359**	.045	-.040	-.083	.003	-.135*
Metro (prox.)							1	-.253**	-.368**	-.323**	-.299**	-.459**
Path Exclusivity								1	.470**	.737**	.504**	.429**
Path Width									1	.602**	.553**	.571**
Modal Conflict										1	.668**	.579**
Path Obstructions											1	.574**
Ped Den (avg.)												1

** $p < 0.05$; ** $p < 0.01$*

Appendix Q: Taipei – Correlations

Songjiang-Nanjing

	BC	CC	SC	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Path Width	Modal Conflict	Path Obs.	Ped Den (avg.)
BC	1	.463**	.657**	.377**	-.293**	.158	-.061	.367**	.375**	.360**	.368**	.449**
CC		1	.423**	.074	-.039	.414**	-.227*	.173	.254*	.275**	.141	.186
SC			1	.314**	-.350**	.085	.055	.484**	.329**	.342**	.313**	.459**
Retail (prop.)				1	-.596**	.147	-.406**	.314**	.310**	.395**	.433**	.756**
Residential (prop.)					1	.082	.438**	-.413**	-.349**	-.226*	-.384**	-.601**
Bus (prox.)						1	-.205	-.126	.057	.177	.027	.061
Metro (prox.)							1	-.049	-.140	-.303**	-.325**	-.499**
Path Exclusivity								1	.439**	.501**	.524**	.455**
Path Width									1	.421**	.468**	.507**
Modal Conflict										1	.615**	.500**
Path Obstructions											1	.605**
Ped Den (avg.)												1

** $p < 0.05$; ** $p < 0.01$*

Zhongxiao-Fuxing

	BC	CC	SC	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Path Width	Modal Conflict	Path Obs.	Ped Den (avg.)
BC	1	.343**	.464**	.182	-.205	-.172	-.258*	.124	.206*	.115	.147	.236*
CC		1	.284**	-.009	-.010	.060	-.077	-.039	.045	.000	.091	.057
SC			1	.404**	-.416**	-.204	-.034	.232*	.318**	.218*	.173	.387**
Retail (prop.)				1	-.739**	-.315**	-.489**	.271**	.476**	.565**	.496**	.851**
Residential (prop.)					1	.318**	.398**	-.394**	-.417**	-.545**	-.517**	-.719**
Bus (prox.)						1	.387**	-.330**	-.478**	-.178	-.281**	-.378**
Metro (prox.)							1	-.129	-.286**	-.271**	-.229*	-.424**
Path Exclusivity								1	.450**	.655**	.478**	.329**
Path Width									1	.471**	.468**	.569**
Modal Conflict										1	.754**	.567**
Path Obstructions											1	.583**
Ped Den (avg.)												1

** $p < 0.05$; ** $p < 0.01$*

Xinyi Anhe

	BC	CC	SC	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Path Width	Modal Conflict	Path Obs.	Ped Den (avg.)
BC	1	.415**	.417**	.301**	-.240*	-.120	-.230*	.062	.249*	.195	.172	.302**
CC		1	.394**	.109	-.097	-.126	-.364**	.152	.105	.157	.121	.157
SC			1	.521**	-.456**	-.373**	-.134	.490**	.300**	.484**	.430**	.401**
Retail (prop.)				1	-.854**	-.376**	-.197	.476**	.405**	.511**	.540**	.748**
Residential (prop.)					1	.341**	.202	-.539**	-.509**	-.502**	-.546**	-.707**
Bus (prox.)						1	.545**	-.399**	-.387**	-.364**	-.369**	-.227*
Metro (prox.)							1	-.215*	-.373**	-.230*	-.315**	-.128
Path Exclusivity								1	.616**	.801**	.659**	.370**
Path Width									1	.533**	.520**	.522**
Modal Conflict										1	.724**	.512**
Path Obstructions											1	.523**
Ped Den (avg.)												1

* $p < 0.05$; ** $p < 0.01$

Taipei (Consolidated)

	BC	CC	SC	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Path Width	Modal Conflict	Path Obs.	Ped Den (avg.)
BC	1	.409**	.493**	.286**	-.263**	-.067	-.194**	.195**	.292**	.222**	.225**	.344**
CC		1	.329**	.059	-.079	.095	-.221**	.099	.164**	.140*	.129*	.158**
SC			1	.393**	-.381**	-.181**	-.018	.381**	.284**	.318**	.291**	.385**
Retail (prop.)				1	-.711**	-.173**	-.380**	.351**	.363**	.486**	.482**	.764**
Residential (prop.)					1	.271**	.363**	-.464**	-.399**	-.482**	-.509**	-.696**
Bus (prox.)						1	.243**	-.301**	-.216**	-.179**	-.246**	-.219**
Metro (prox.)							1	-.139*	-.235**	-.278**	-.287**	-.382**
Path Exclusivity								1	.460**	.664**	.555**	.402**
Path Width									1	.440**	.442**	.529**
Modal Conflict										1	.720**	.556**
Path Obstructions											1	.575**
Ped Den (avg.)												1

* $p < 0.05$; ** $p < 0.01$

Appendix R: Tokyo – Correlations

Ikebukuro

	BC	CC	SC	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Path Width	Modal Conflict	Path Obs.	Ped Den (avg.)
BC	1	.380**	.543**	.355**	-.005	-.153	-.091	.169	.211	.145	.188	.488**
CC		1	.267*	.500**	-.214*	-.426**	-.441**	.130	.221*	.125	.184	.370**
SC			1	.466**	-.176	-.211	.077	.306**	.321**	.399**	.357**	.523**
Retail (prop.)				1	-.417**	-.433**	-.609**	.353**	.235*	.426**	.454**	.623**
Residential (prop.)					1	.095	.339**	-.319**	-.138	-.179	-.315**	-.442**
Bus (prox.)						1	.555**	-.226*	-.279**	-.272*	-.319**	-.385**
Metro (prox.)							1	-.220*	-.093	-.251*	-.338**	-.431**
Path Exclusivity								1	.365**	.743**	.531**	.453**
Path Width									1	.452**	.414**	.505**
Modal Conflict										1	.668**	.500**
Path Obstructions											1	.614**
Ped Den (avg.)												1

* $p < 0.05$; ** $p < 0.01$

Nakano

	BC	CC	SC	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Path Width	Modal Conflict	Path Obs.	Ped Den (avg.)
BC	1	.532**	.418**	.414**	-.209	-.164	-.334**	.153	.227*	.274*	.117	.432**
CC		1	.492**	.454**	-.429**	-.472**	-.444**	.522**	.425**	.537**	.234*	.435**
SC			1	.537**	-.604**	-.496**	-.403**	.563**	.325**	.468**	.235*	.547**
Retail (prop.)				1	-.717**	-.562**	-.644**	.589**	.486**	.546**	.277*	.697**
Residential (prop.)					1	.757**	.529**	-.726**	-.471**	-.665**	-.209	-.630**
Bus (prox.)						1	.546**	-.742**	-.575**	-.736**	-.267*	-.572**
Metro (prox.)							1	-.444**	-.272*	-.505**	-.302**	-.651**
Path Exclusivity								1	.559**	.804**	.256*	.476**
Path Width									1	.716**	.627**	.583**
Modal Conflict										1	.525**	.601**
Path Obstructions											1	.525**
Ped Den (avg.)												1

* $p < 0.05$; ** $p < 0.01$

Akasaka

	BC	CC	SC	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Path Width	Modal Conflict	Path Obs.	Ped Den (avg.)
BC	1	.445**	.331**	.258*	-.324**	.002	.129	.127	.021	.213	.109	.444**
CC		1	.244*	.145	-.202	-.428**	.029	.173	.181	.281**	.240*	.182
SC			1	.528**	-.495**	-.335**	-.238*	.432**	.197	.374**	.194	.401**
Retail (prop.)				1	-.553**	-.496**	-.338**	.353**	.290**	.394**	.324**	.638**
Residential (prop.)					1	.508**	.321**	-.676**	-.270*	-.624**	-.356**	-.583**
Bus (prox.)						1	.587**	-.398**	-.092	-.399**	-.317**	-.457**
Metro (prox.)							1	-.250*	.071	-.105	.047	-.178
Path Exclusivity								1	.291**	.782**	.439**	.337**
Path Width									1	.381**	.343**	.338**
Modal Conflict										1	.692**	.480**
Path Obstructions											1	.475**
Ped Den (avg.)												1

* $p < 0.05$; ** $p < 0.01$

Tokyo (Consolidated)

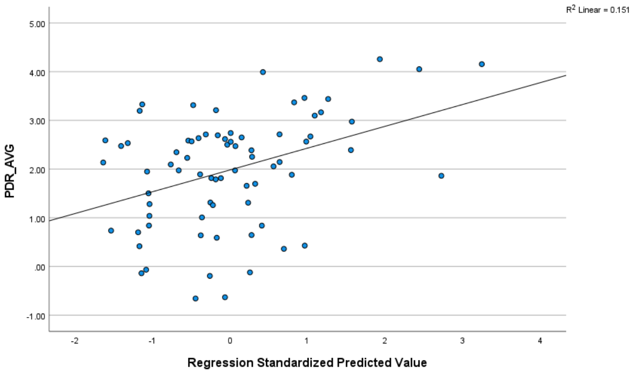
	BC	CC	SC	Retail (prop.)	Residential (prop.)	Bus (prox.)	Metro (prox.)	Path Ex.	Path Width	Modal Conflict	Path Obs.	Ped Den (avg.)
BC	1	.410**	.321**	.255**	-.128*	-.010	.054	.120	.089	.167**	.108	.394**
CC		1	.368**	.356**	-.316**	-.440**	-.280**	.308**	.222**	.337**	.223**	.334**
SC			1	.552**	-.539**	-.442**	-.323**	.451**	.235**	.403**	.253**	.503**
Retail (prop.)				1	-.619**	-.556**	-.537**	.435**	.282**	.434**	.349**	.669**
Residential (prop.)					1	.611**	.483**	-.605**	-.260**	-.531**	-.300**	-.570**
Bus (prox.)						1	.595**	-.479**	-.215**	-.466**	-.305**	-.504**
Metro (prox.)							1	-.319**	-.090	-.315**	-.198**	-.437**
Path Exclusivity								1	.346**	.776**	.416**	.424**
Path Width									1	.446**	.400**	.411**
Modal Conflict										1	.637**	.514**
Path Obstructions											1	.534**
Ped Den (avg.)												1

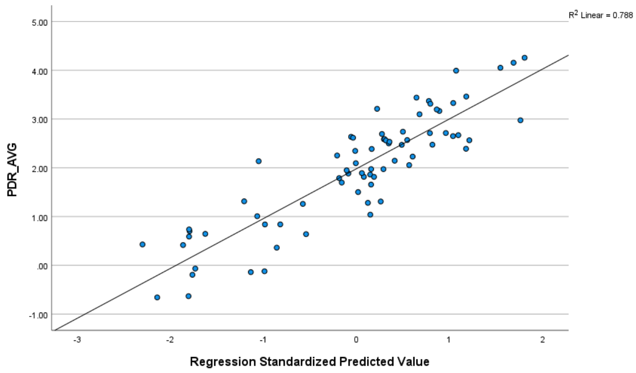
* $p < 0.05$; ** $p < 0.01$

Appendix S: Bangkok – Regression Plots

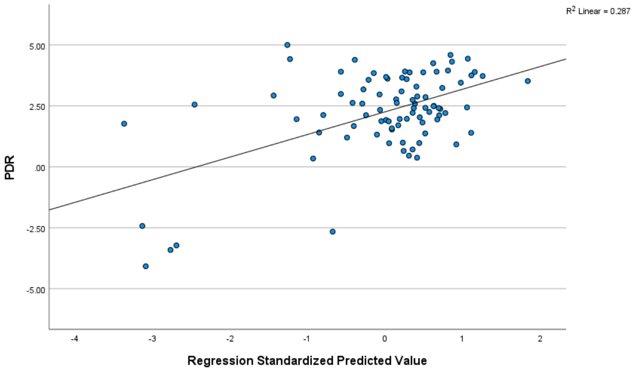
Centrality	Full Model

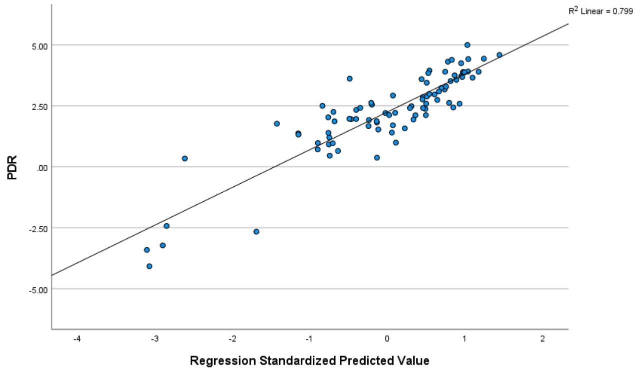
Sukhumvit



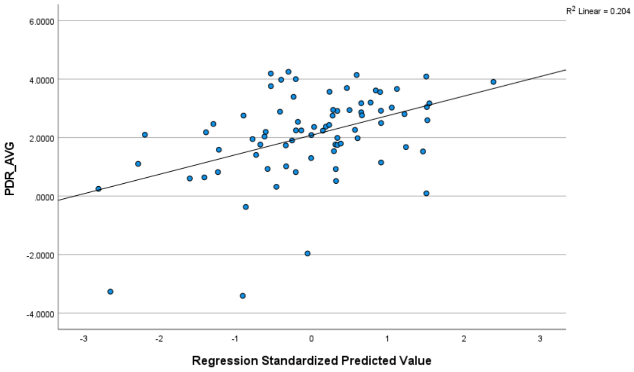


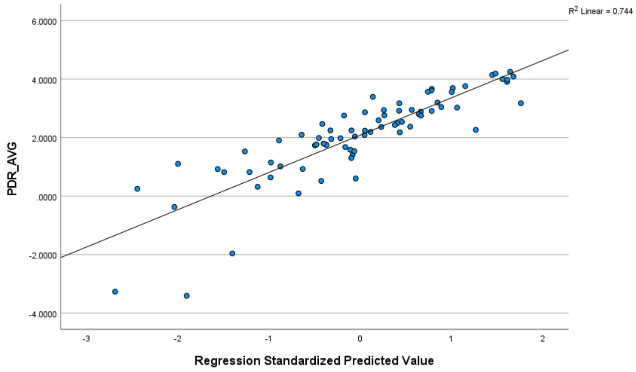
Sala Daeng



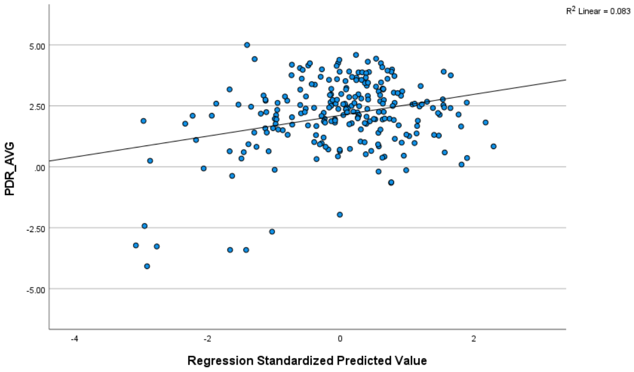


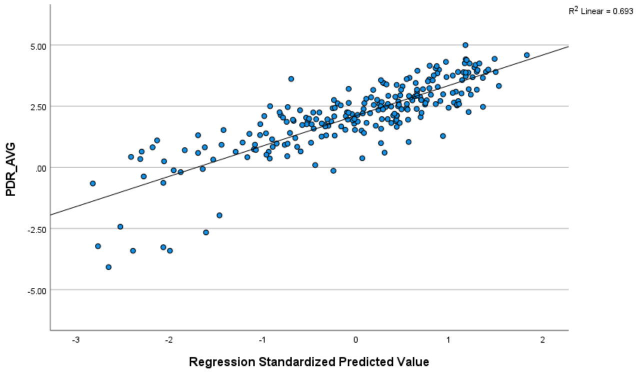
Chong Nonsi





Bangkok (Consolidated)

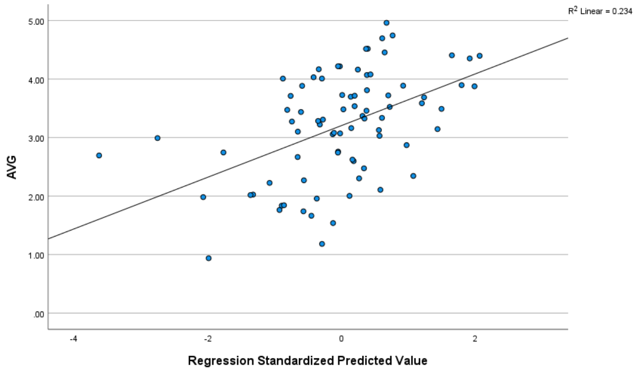


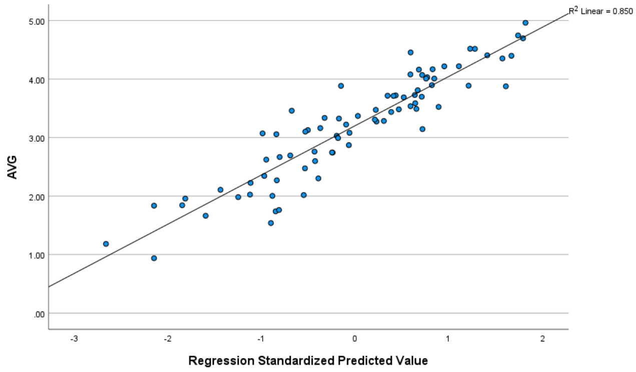


Appendix T: Manila – Regression Plots

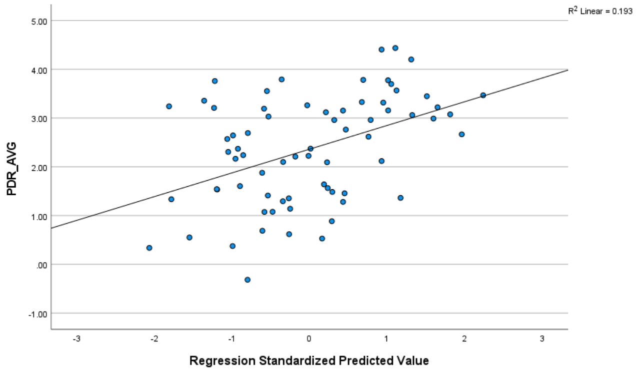
Centrality	Full Model

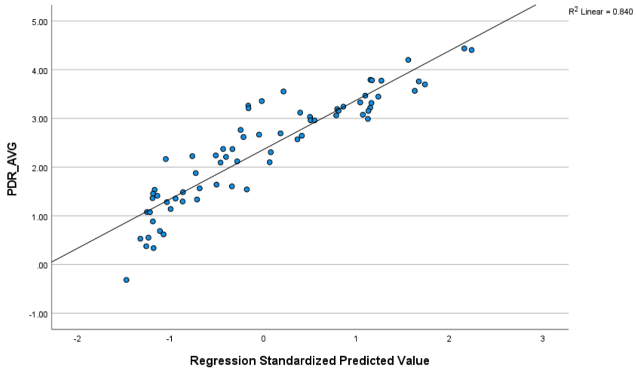
Carriedo



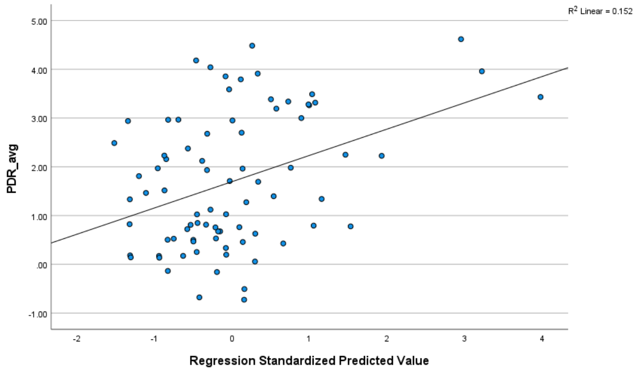


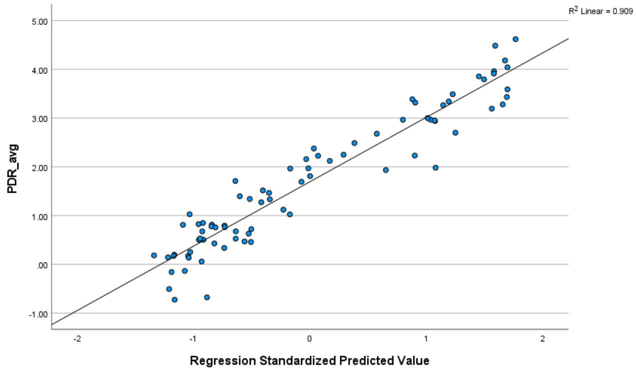
Pedro Gil



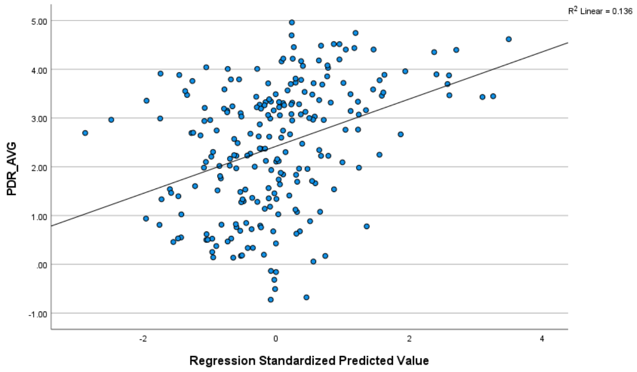


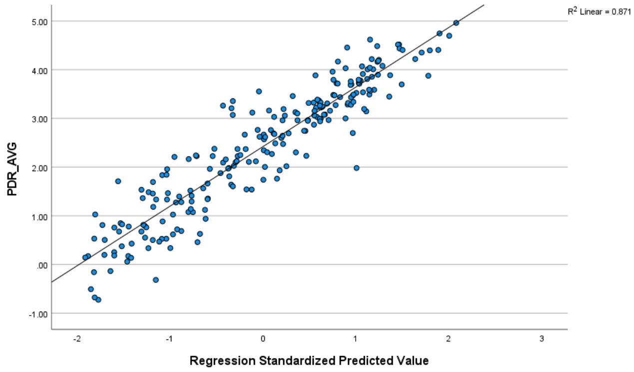
Roosevelt





Manila (Consolidated)

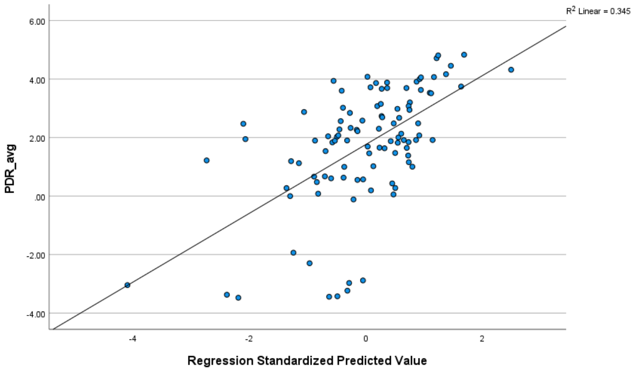


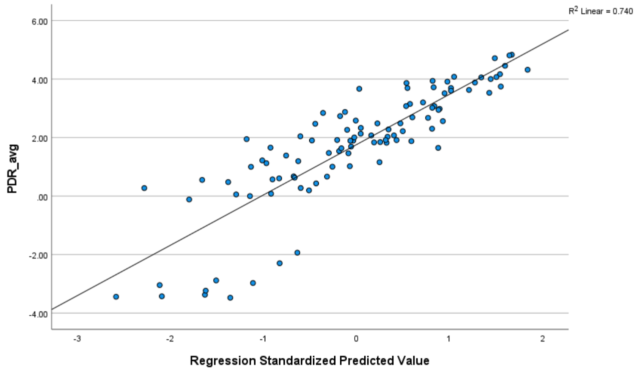


Appendix U: Osaka – Regression Plots

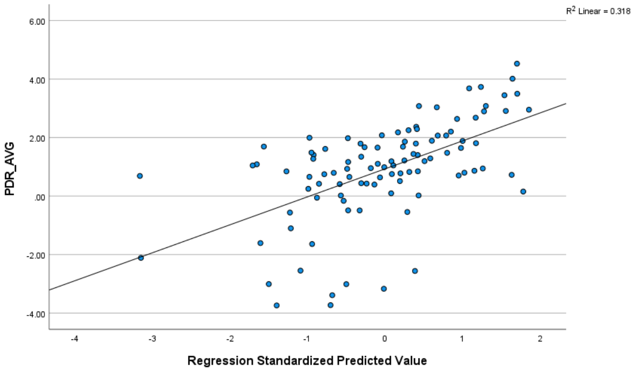
Centrality | **Full Model**

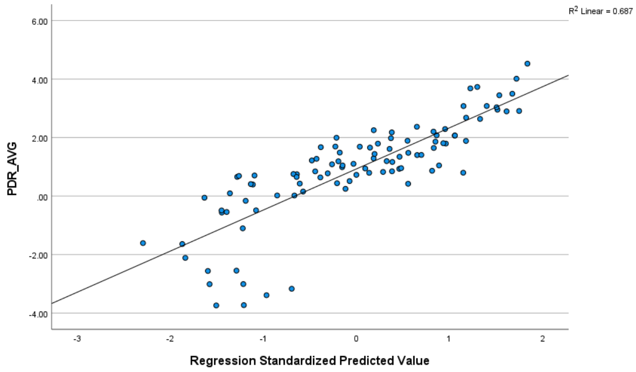
Namba



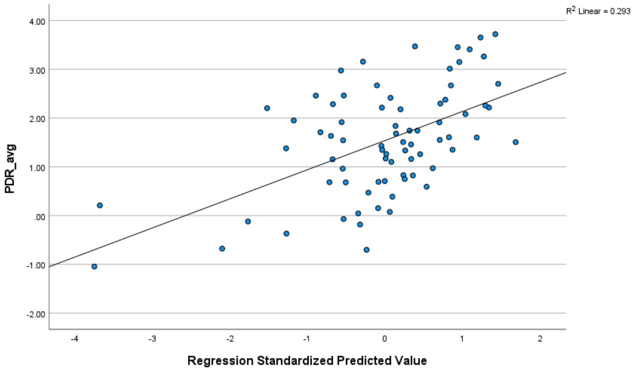


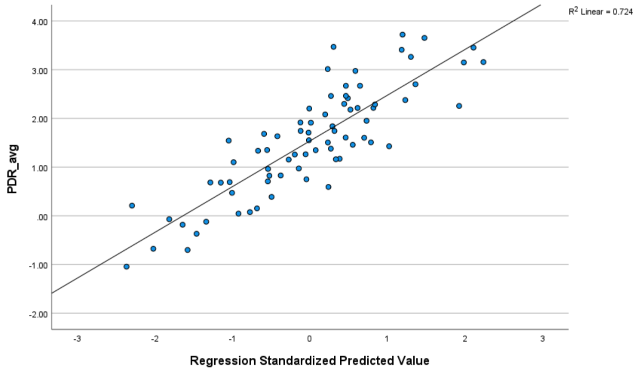
Tsuruhashi



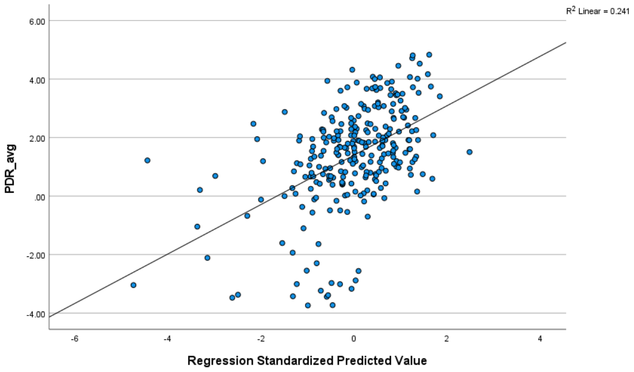


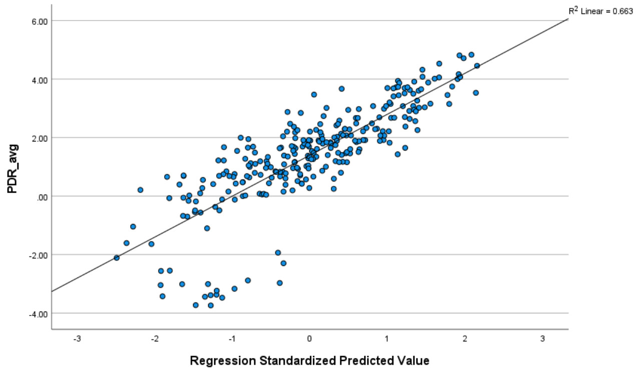
Tanimachi-Yonchome





Osaka (Consolidated)

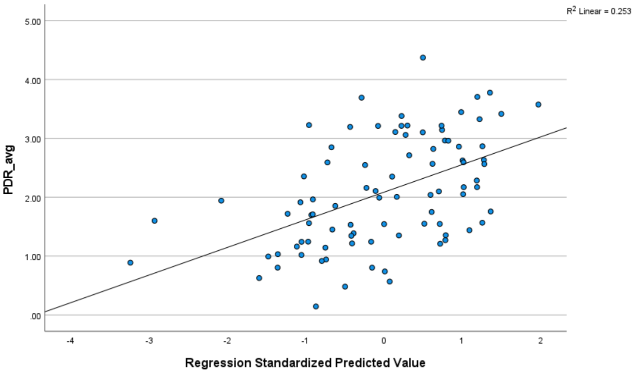


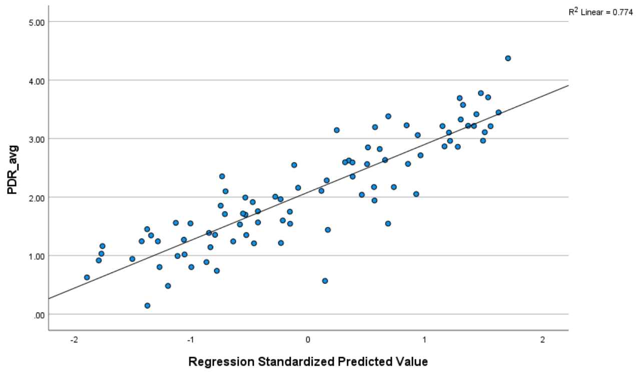


Appendix V: Taipei – Regression Plots

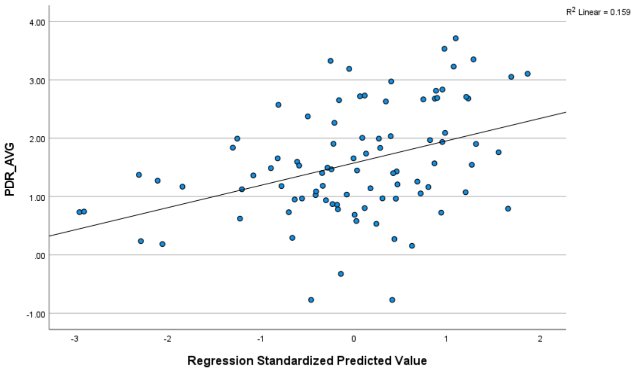
Centrality | **Full Model**

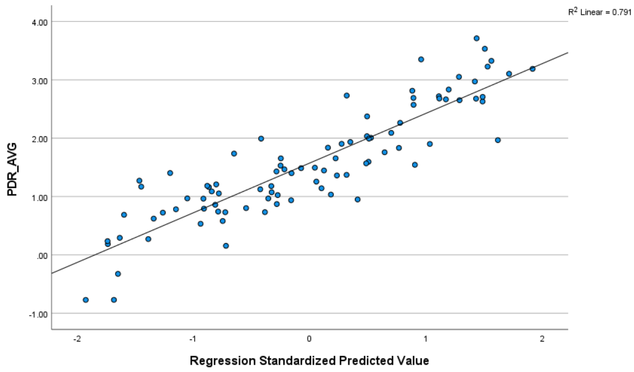
Songjiang-Nanjing



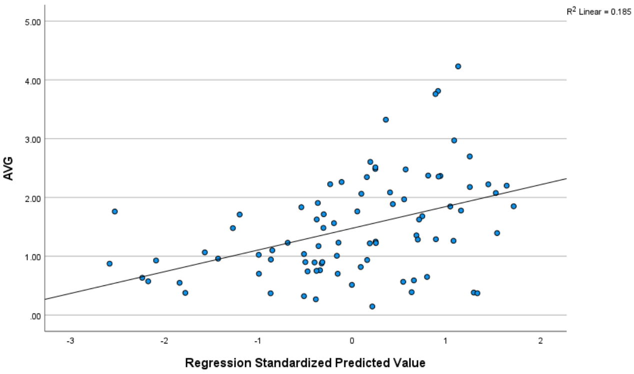


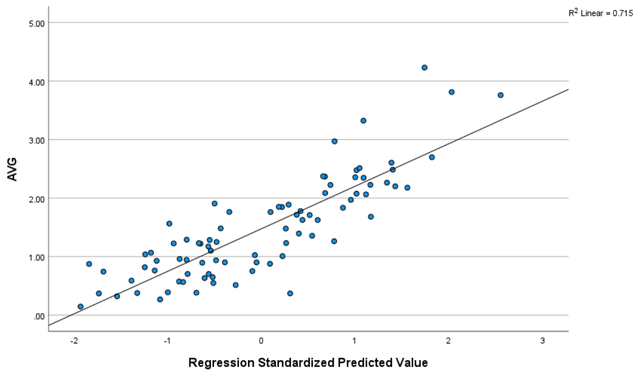
Zhongxiao-Nanjing



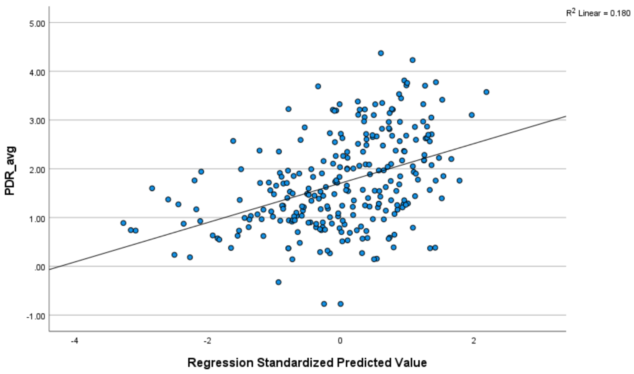


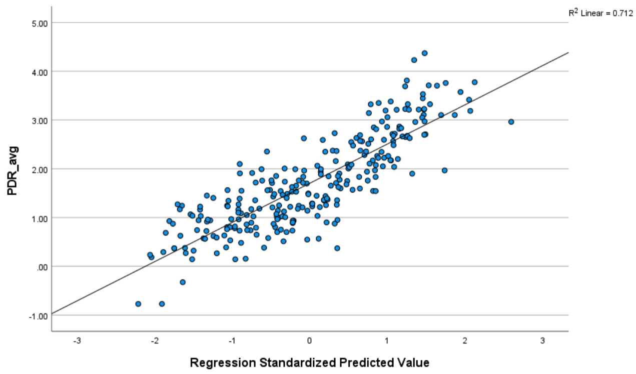
Xinyi Anhe





Taipei (Consolidated)

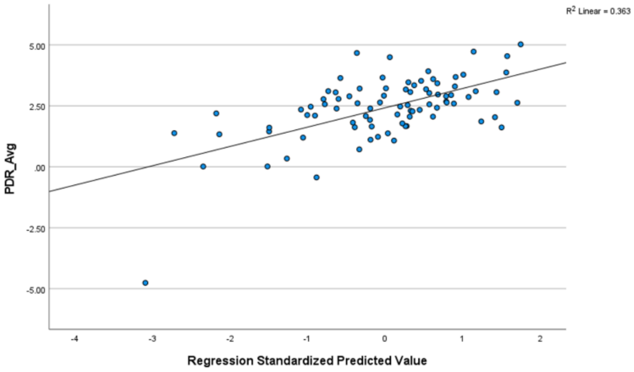


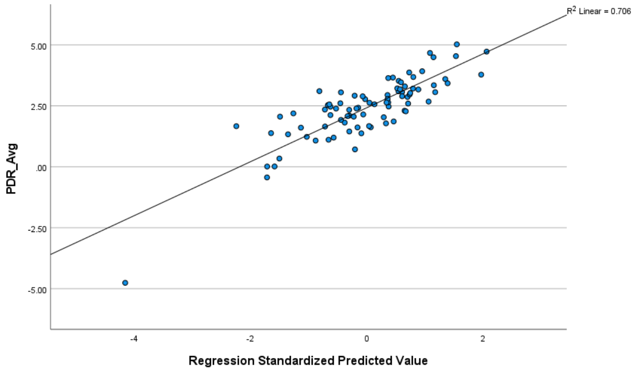


Appendix W: Tokyo – Regression Plots

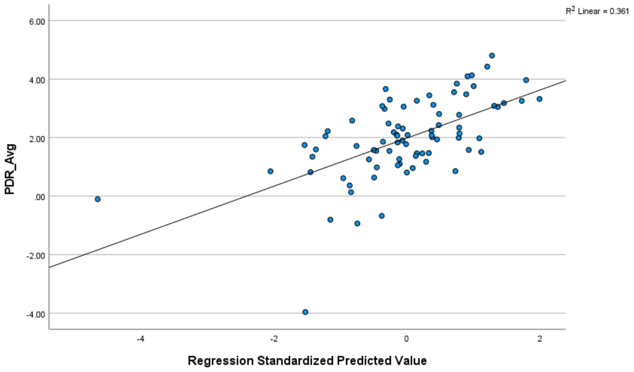
Centrality	Full Model

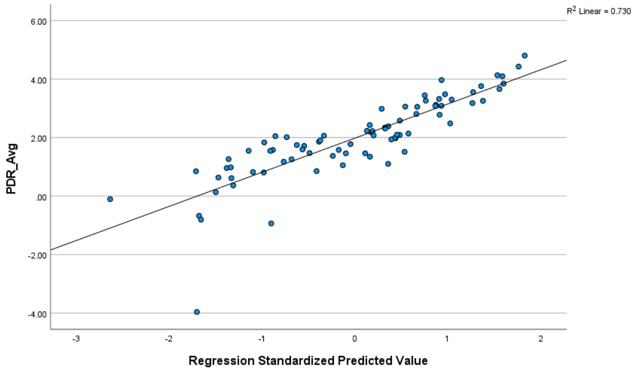
Ikebukuro



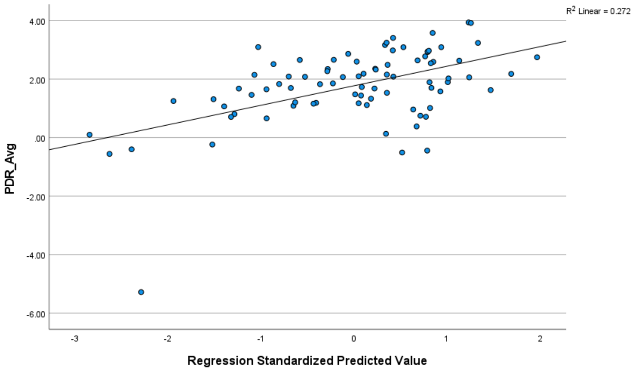


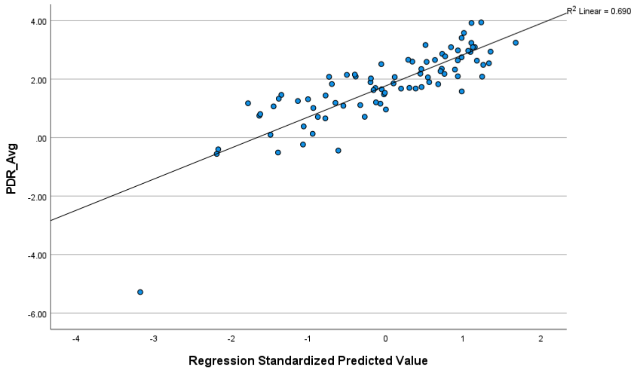
Nakano





Akasaka





Tokyo (Consolidated)