Using Space Syntax to Rediscover Metro Manila's Old Urbanism: Retrofitting a City-Region for Sustainability and Resilience

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Abstract—The sustainability of the built environment is reliant on the spatial configuration of our towns and cities. The post-war, car-centric suburban expansion of cities like Metro Manila must be retrofitted to adapt our built environment into something more sustainable and resilient to climate change and man-made disasters. New Urbanism distils concepts that can be used as best practices to retrofit suburbia and create new settlements that recall traditional towns and cities, but with mixed results. Some have argued that New Urbanism is historicist, and merely another way of creating new gated communities, while some have questioned the success of its application in retrofitting existing suburbs. An extension of New Urbanism is the discourse of the Fifteen-Minute City, which attracted renewed attention as a reaction to lockdowns brought about by the COVID pandemic. Distances covered by pedestrian and cycling journeys are used to define the Fifteen-Minute city. This article uses space syntax, a set of techniques for analyzing urban space, to analyze the "old" urbanism of Metro Manila and discover the latent spatial configuration. The findings add some quantitative detail to the discourse on the Fifteen-Minute City and New Urbanism, which can guide the retrofitting of city-regions like Metro Manila. New Urbanism needs to learn quantitatively from "Old" Urbanism to rediscover how to create sustainable and resilient cities.

Introduction

Background

The World Green Building Council and International Energy Agency (2017) finds that up to 39 percent of worldwide carbon emissions are produced by buildings and construction, made up of 28 percent for operational emissions (cooling, heating, etc.), and 11 percent for the actual act of constructing buildings. This clearly does not account for the effects of how buildings, land uses, and streets are planned and organized within city-regions like Metro Manila, namely the carbon emissions brought about by the need to travel longer distances to and from suburbs, the time and energy lost to traffic, and the downstream adverse effects to health, mental well-being and family life.

Post-war expansion in Metro Manila has seen an explosion in the distance and time of travel for suburban residents, and a rise in socio-spatial inequities as the real estate

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markets push the working class further away from centers of employment, or force those who must live within cities to live in smaller and smaller air-conditioned flats with less access to free and public open spaces and amenities.

These extremes of development are increasingly unsustainable as they increase both energy consumption and emissions that contribute to climate change. Advocates from planning and architectural professions like Duany Plater-Zyberk preach on the need to develop new walkable communities in line with New Urbanism and its conceptual toolbox of methods and terminologies such as transect planning, smart growth and the smart code (Congress for New Urbanism 2000; Duany and Plater-Zyberk 1992 1999; Duany, Plater-Zyberk, and Speck 2000; Plater-Zyberk 1999; Duany and Talen 2002; Duany et al. 2010; Duany and Plater-Zyberk 2005). While these ideas appeal to developers looking to build new and more affluent communities from scratch (Al-Hindi 2001), it has become challenging to translate the same principles to redevelop and retrofit existing communities into more sustainable settings because of existing building stock, street networks, and status-conscious communities (Sweeney and Hanlon 2016). Many have argued that New Urbanism is a nostalgic repackaging of suburbs into what people recall as small-town America (Silver 2016; Garnett 2015; Trudeau and Malloy 2011).

Pandemic-induced lockdowns have also raised the discourse on the Fifteen-Minute City in response to the lack of local jobs, opportunities, and amenities for distant suburban communities. Duany and Steuteville (2021) expounded a concept of nested travel sheds (areas within the range of a certain mode of transport) as an extension of concepts previously discussed under the broader umbrella of New Urbanism.

New Urbanism and the 15-Minute City have been part of urban planning discourse for some time now. It is important to look deeper beyond these old typologies of buildings and open spaces, and the circular radii of travel sheds to adapt these concepts for the task of retrofitting existing settlements. This article uses space syntax, a set of techniques for analyzing urban space, to trace Manila's historical and colonial forms of urbanism, and to understand latent patterns in its existing suburban fabric, which could be the key for suburban retrofitting and reorganization. The article examines the underlying patterns of spatial configuration in Manila's Spanish Intramuros and Extramuros; the patterns of spatial configuration in Daniel Burnham's City Beautiful Plan and its adaptation during American colonial city development; the patterns of spatial configuration that drove Manila's post-war suburban development; and the latent spatial centralities in Metro Manila's suburban fabric that can be used to reconfigure car-centric suburbs into a 15-Minute walkable city.

Manila's historical urban development

Metro Manila grew outward from a historical core like the layering of tree rings (Ocampo 1992; Murphy and Hogan 2012). The Spanish walled-city of Intramuros was based on church-and-plaza urbanism described in Phillip II's Laws of the Indies (Armengol 1958; Doeppers 1972; Quirino 1971; Shioda et al 2012; Goma 2012; and Jimenez Verdejo et al 2015). The Americans expanded Manila beyond its Spanish walls using Daniel Burnham's City Beautiful Plan as a guide (Duque 2009; Morley 2014;

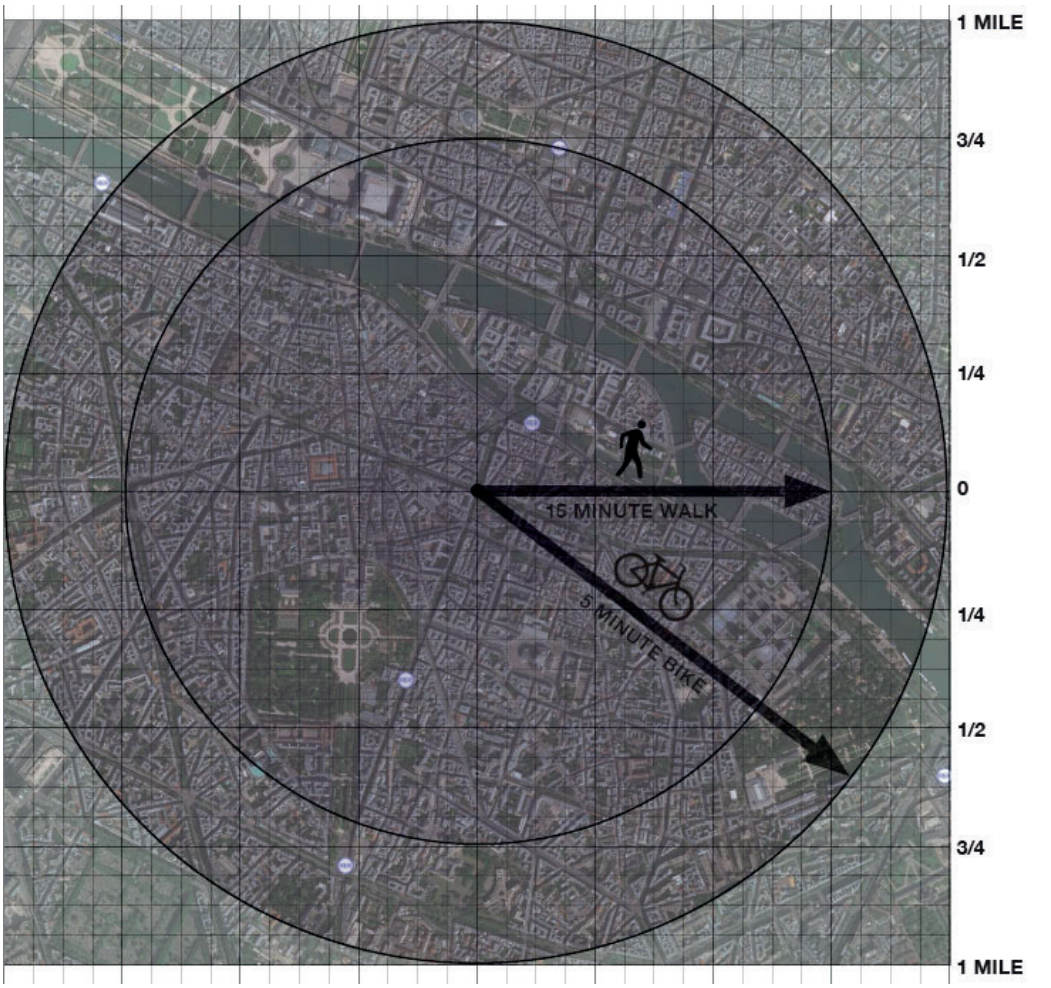

Figure 1. The scale of the 15-minute walk and 5-minute bike sheds in the center of Paris, France. Source: Duany and Steuteville, 2021.

Vernon 2014; Kirsch 2017; and Morley 2018). After the Second World War, Metro Manila underwent suburbanization, typified by the extension of Epifanio Delos Santos Avenue toward new suburbs of Quezon City to the north, privatized suburbs of Makati to the south, and further to the regional fringes of Cavite, Bulacan, and Laguna, forming a sprawling urban mass (Pante 2017; Connell 1999; Garrido 2013, 2019).

The post-war boom saw the growth of suburban regions carpeted by mass-produced housing built on relatively cheaper land, connected by highways to downtowns and new business districts and malls (Garreau 1992). This car-centric pattern of development arose in the United States and was copied worldwide, especially in countries looking to let their citizens partake in the sense of freedom and space afforded by cheap oil, cars, and their own single-family lots (Duany, Plater-Zyberk, and Speck 2000). This explosion in scale and distance around old city cores was paralleled by the concentration of commercial activity into new towns and edge cities, dotted with large shopping malls that became their new downtowns (Gruen and Smith 1960). These new regional centers were designed to be accessed by cars, and configured to capitalize on the surrounding catchment population within the single-family-only residential areas, where

other land uses and amenities, including local neighborhood shops, were forbidden. This benefited mall-based businesses, which managed the supply chain as far as the mall, and left the shopper to provide the last car-borne leg from the mall to the home, allowing the mall entrepreneurs to gain the critical mass needed to lower the price of goods while increasing selection and convenience for their suburban clientele. The typical suburban resident enjoyed the convenience of one-stop shopping within the climate-controlled comfort of the mall (Gruen 1964).

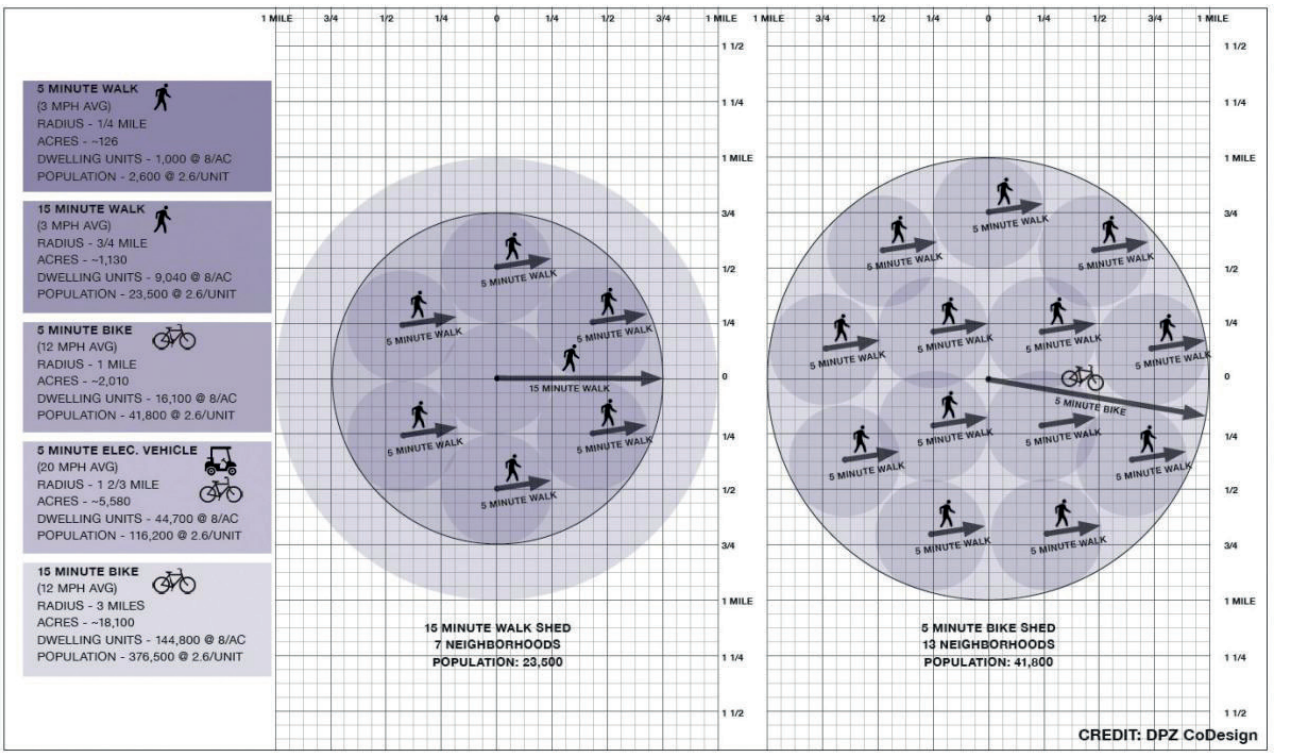

Figure 2. Neighborhoods fitting in the 15-minute walk and 5-minute bike shed. Source: Duany and Steuteville, 2021.

In cities with problems of inequality, security and safety, malls become the social venues for suburban residents (Chiodelli and Moroni 2015; Staeheli and Mitchell 2006). This car-centric suburbanization was a global homogenizing force, creating the same values and expectations for global suburban residents (Ortega 2016, 2018). But this was underpinned by cheap oil with clear consequences for climate, resiliency, public health and obesity (Low et al. 2016; Davis, Valsecchi, and Fergusson 2007; Banister 2011; Wee 2014). This pattern appeared throughout Southeast Asia (Mohamad and Kiggundu 2007; Mohamad 2005; Small 2022), where Japanese and Korean auto manufacturers succeeded the Americans, and local housing and mall entrepreneurs helped to market the suburban American lifestyle. Manila was perhaps more enthralled with this development than elsewhere, given its colonial heritage and its residual affinity for all things American (Rith et al. 2018; Ortega 2016).

Responses to suburbanism, COVID lockdowns, 15-Minute Cities and New Urbanism

Government-imposed lockdowns during the COVID pandemic speeded the trend to online working, especially for knowledge-based occupations, and highlighted the true value of essential workers, who still had to commute long distances to service their client communities. These lockdowns emphasized just how dependent urban residents are on long-distance travel and supply chains, and led to debate on how to move beyond this dependence (Sharifi and Khavarian-Garmsir 2020; Sadowski et al. 2021; Askarizad, Jinliao, and Jafari 2021). Duany and Steuteville (2021) proposed localizing settlements within ranges without the car: fifteen minutes by walking (1.2 km), five minutes by bicycle (1.6 km), public transport stops at every 1.6 km, main commuter hubs at every 3 km, and e-vehicles for daily travel commutes up to 8 kms. The 15-Minute City envisages a localized lifestyle where living-working-learning-playing is confined within a tighter geographical scale than the former metro-regional scale.

Figure 3. Seaside Florida's Main Plaza / Park. Source: SoWal Staff, 2022

The 15-Minute City is an elaboration of New Urbanism which proposed a menu of methods to revive local neighborhoods with a sense of historical character (Congress for New Urbanism 2000; Duany and Plater-Zyberk 1992, 1999; Duany, Plater-Zyberk, and Speck 2000; Duany and Talen 2002). New Urbanism is open to the criticism that it is just another form of "branded placemaking" for gated developments for the wealthy (Al-Hindi 2001), such as Seaside and Celebration in Florida (Figure 3).

Understanding Metro Manila with Space Syntax

The elements of Space Syntax

Space syntax is a set of techniques for analyzing spatial layouts and patterns of human activity in buildings and urban areas, that can be used to trace how urban settlements have developed organically over time (Hillier and Hanson 1984).[1] Space syntax uses graphical representations through geometric forms such as axial lines to portray streets, connected by nodes to form networks, to reveal the underlying spatial system of the built environment (Figures 4, 6). Emo (2014) shows that humans visually perceive space through such axial lines (Figure 5).

Figure 4. Barnsbury Axial Graph. Source: Al-Sayed et al. 2014: 62; Space Syntax Methodology, Bartlett School of Architecture, UCL, London.

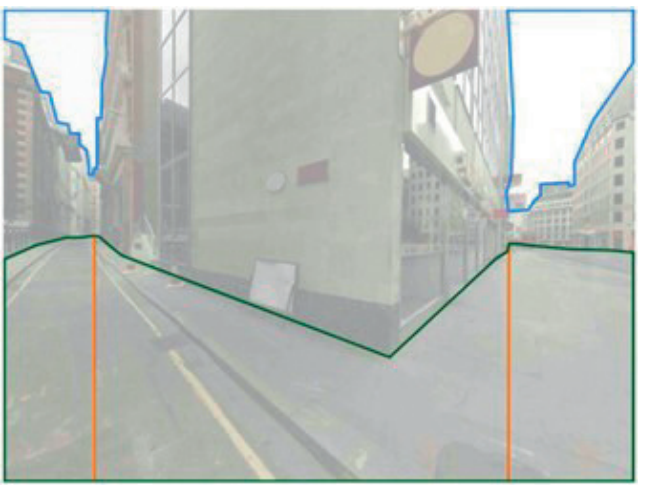

Figure 5. Axial Lines shown overlaid onto streetscapes. Source: Emo, 2014.

The form of a network is mathematically analyzed using graph theory (Hillier and Hanson 1984). The relationships between spatial elements are analyzed using two main measures. *Integration* is a measure of the closeness of this space to all other spaces, in other words its "centrality," given a certain means of transport. Integration measures the probable capacity of the spatial network to foster movement toward this location. *Betweenness* (sometimes termed *choice*) is a measure of the attraction of this space as a

[1] Space Syntax is a probabilistic method based on applying graph centralities to highlight latent patterns and understand how they correlate and support historical and ethnographic patterns/observations. As this is a limited and largely historical study, there has been no attempt to confirm how centralities correlate with actual traffic and movement counts from those eras, or in the present-day context. All spatial network analysis is undertaken using a combination of QGIS and Depthmap X software (depthmap X development team 2017), with statistical analysis using IBM SPSS software. The majority of this study was undertaken offsite in London during a span of five months. It relies on available historical maps from archival sources online and from the British Library, and from Open Street Map, Google Earth and the Philippine Geoportal.

route between other spaces, given a certain means of transport. *Betweenness* measures the probable capacity of the spatial network to generate through movement between any two points.[2] These two measures show the configuration of space which determines the probability of pedestrian and vehicular movement, and thus also social settlement and behavior (Hillier et al 1993).

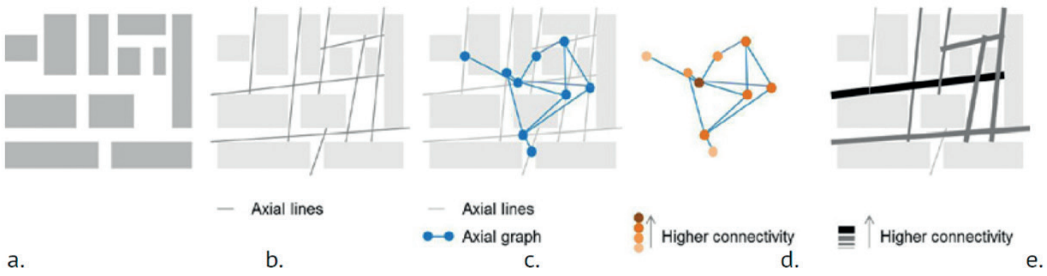

Figure 6. Translation from streetscape to axial lines, to spatial graph. Source: Al-Sayed et al. 2014: 12; Space Syntax Methodology, Bartlett School of Architecture, UCL, London.

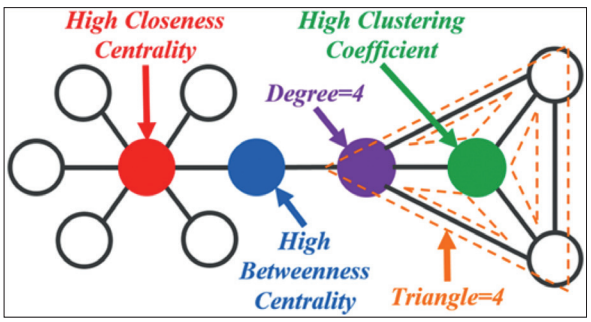

Figure 7. Applied Graph/Network Theory Centralities. Source: Leskovec (2019)

The pattern of *integration* and *betweenness* creates some areas which are more vibrant and active and other areas that are relatively quiet. Hillier and Vaughan (2007) described a dual network with a foreground network of more intense exchange and interaction, and a more stable background network of the social and cultural relations within residential communities. Hillier (1999) highlights that centralities grow, migrate, shift or diffuse over time as the foreground and background networks grow and develop.

The study of London after the great fire of 1666 by Hanson (1989) and the study of ancient Persian cities by Karimi (2012) discuss the interplay between order, which is imposed top-down, and structure, which grows bottom-up. Both authors discuss how attempts to impose order on disorderly spatial fabrics fall apart when they confront the centralities in the structure which underpins the society.[3]

[2] "These two measures reflect the two fundamental elements in human movement: firstly, the selection of a destination, and secondly, the selection of a route. One measures the ease of access (integration) and the other measures the passing flow (choice)." UCL Space Syntax (n.d.).

[3] This study uses space syntax's method of angular segment analysis (Turner 2000; Turner 2001; Turner 2005; Dalton 2001; Turner 2007; Charalambous and Mavridou 2012), to produce measures of Normalized Angular

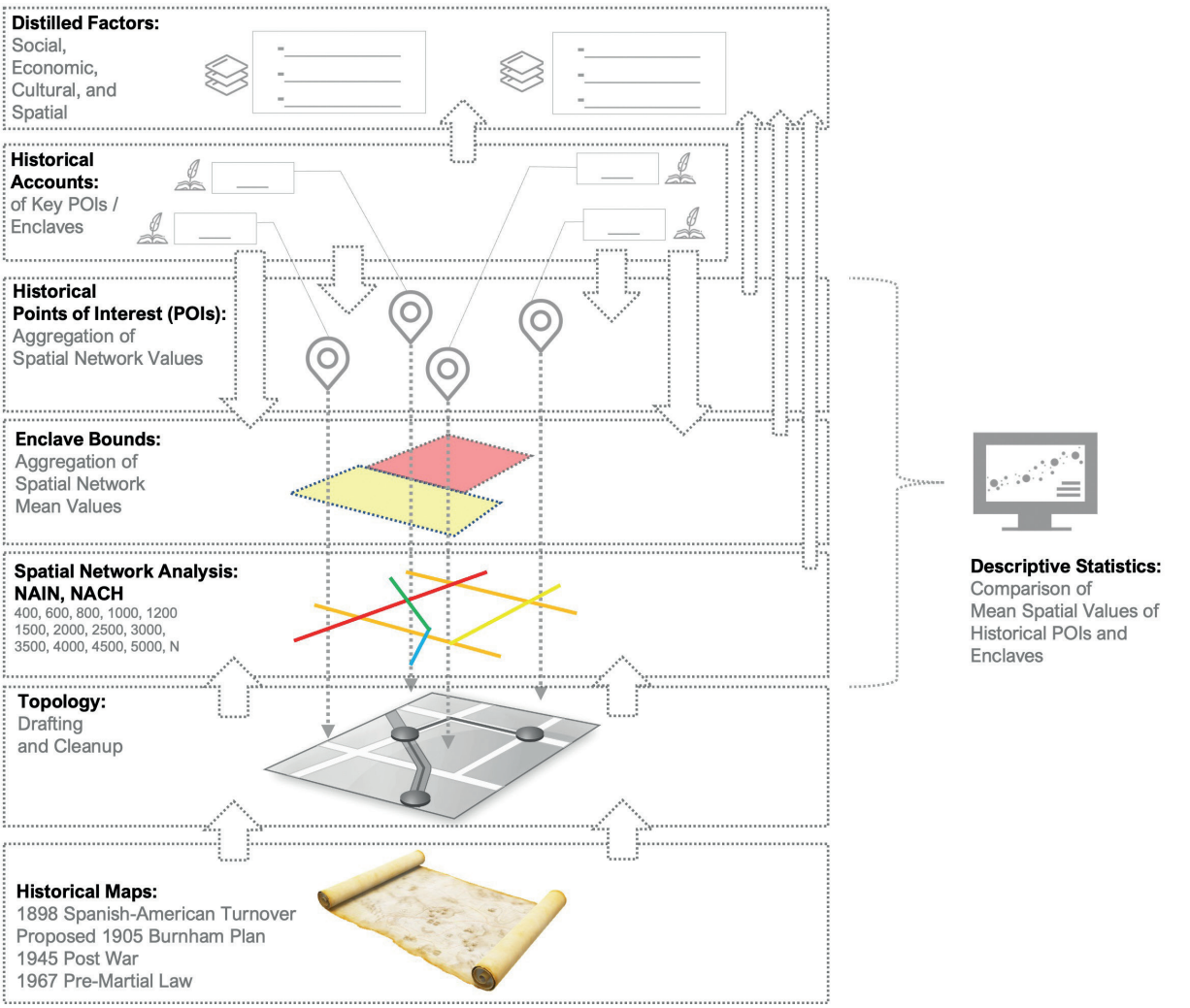

Figure 8. Framework for assessing Manila's historical configuration, showing historical maps and historical accounts as sources for data for aggregation and descriptive statistical analysis.

Manila by Space Syntax

Spanish Manila, Intramuros and Extramuros

The walled city of Intramuros (Figure 9) was planned according to King Phillip II's Laws of the Indies, with a grid of streets that connect a hierarchy of plazas with various

Integration (NAIN/closeness or nearness centrality) and Normalised Angular Choice (NACH/betweenness centrality) (Hillier, Yang and Turner 2012) for the historical and present-day spatial networks. These values vary according to the scale of movement ranging from local/pedestrian (400, 800, 1200m) to macro/vehicular scales (2500, 5000m, global range). The values derived from the spatial analysis are related to points-of-interest (Yang 2015), including historical landmarks and boundaries, and the socio-spatial narratives in the historical literature. This methodology is summarized in Figure 8.

points-of-interest such as churches, government buildings, educational, healthcare, military and commercial buildings (Doeppers 1972: 769–792). Figure 10 shows the spatial graph of an 1851 map of Intramuros. These points-of-interest are all within a walking distance of 15-20 minutes of one other within the walled city, hence this spatial network has a high probability of generating pedestrian movement.

Measuring less than 1.5 km on the longest dimension, Intramuros was a self-contained walkable 15 to 20-minute city. Its spatial network graph (Figure 10) lights up the warmer color ranges indicating that its street grid has high *integration*). Cooler ranges (green to blue) are found on the edges of the grid network, within interior streets, on the northern triangular end (point 33) of Fort Santiago, and on the pathways leading out of the walled city. These show that Intramuros looks inward and is segregated from the spatial network outside the walled city, a legacy of its role as an urban fortress for colonial residents.

The mission settlements of Extramuros were founded by the Spanish colonists under the *reducciones* system of evangelization to relocate the indigenous population within range of *bajo de la campana* or the "voice" of the church bells. They formed the suburbs or *arrabales* outside the walled city of Intramuros (Figure 11).

The 1898 spatial graph (Figure 12, generated from Figure 11) shows *integration* centrality within a pedestrian range of movement of 400 meters. The mission churches are largely located in areas with higher local/pedestrian integration values than those within Intramuros (Figure 14). Each of these mission areas was integrated within a 5–10-minute walking distance. 1898 Manila was around 6-7 km from end-to-end. This was within the travel range of around 15-20 minutes by the Tranvia tram system from the Spanish era.

While the 1898 Manila map was drawn with Intramuros at the center, on a *betweenness* graph (Figure 13), the major routes identified by warm colors lead to the Binondo trading district. An *integration* graph has the same result (Figure 14). Binondo was the true center of the colonial city.

On this same graph, the cooler colors of the street segments within Intramuros show that Intramuros was segregated as an enclave. Through the military camps on the major routes from Intramuros and Binondo, the Spanish segregated Intramuros as a means to impose order on the city itself and the surrounding area.

That Binondo emerges as the spatial integration core of 1898 Manila (warm segments concentrating within Binondo in Figure 13), is a twist of irony since Binondo was founded in 1594, the first Chinatown in the world, as a means to isolate and marginalize the Sangleys (Chinese traders), who originally set-up shop just outside Intramuros, within a mission district across the Pasig River. The Spanish were afraid of revolt, fire, and disease close to Intramuros. Through a network of bridges and feeder streets, Binondo became the true socio-spatial core of the city. The attempts to impose order and control on the built environment had unintended consequences for the latent centralities in the spatial network.

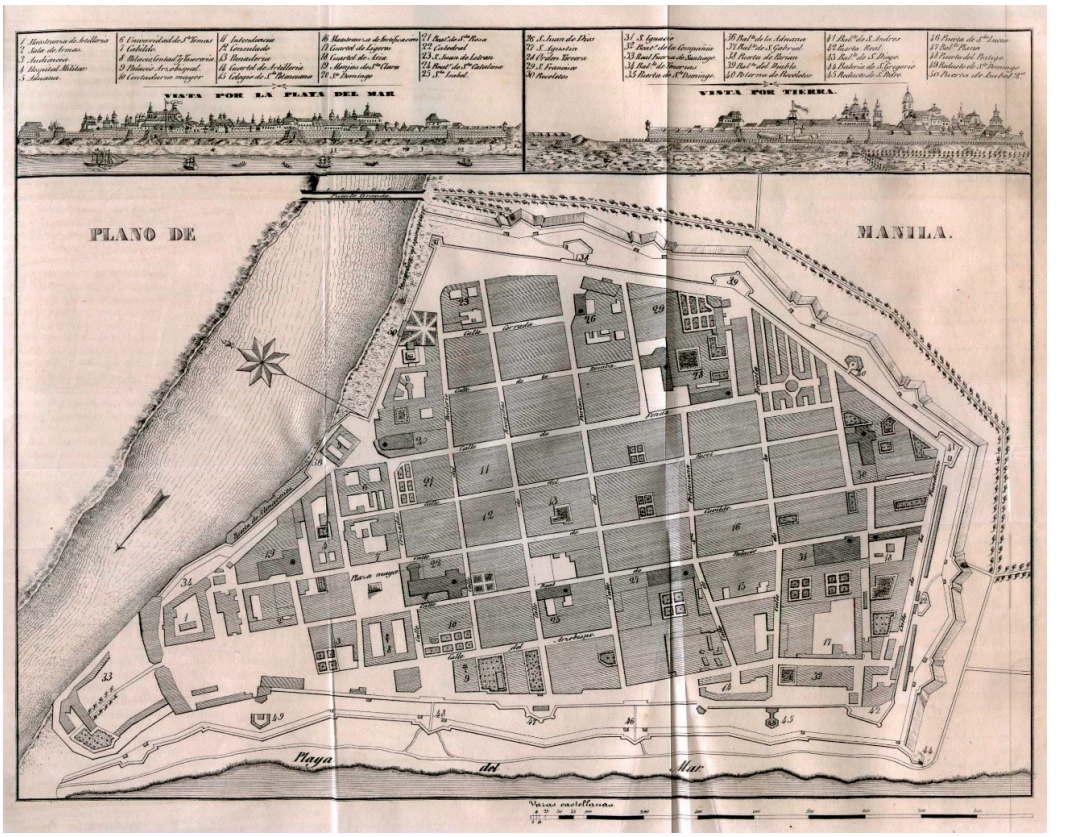

Figure 9. Intramuros 1851. Source: Intramuros (1851).

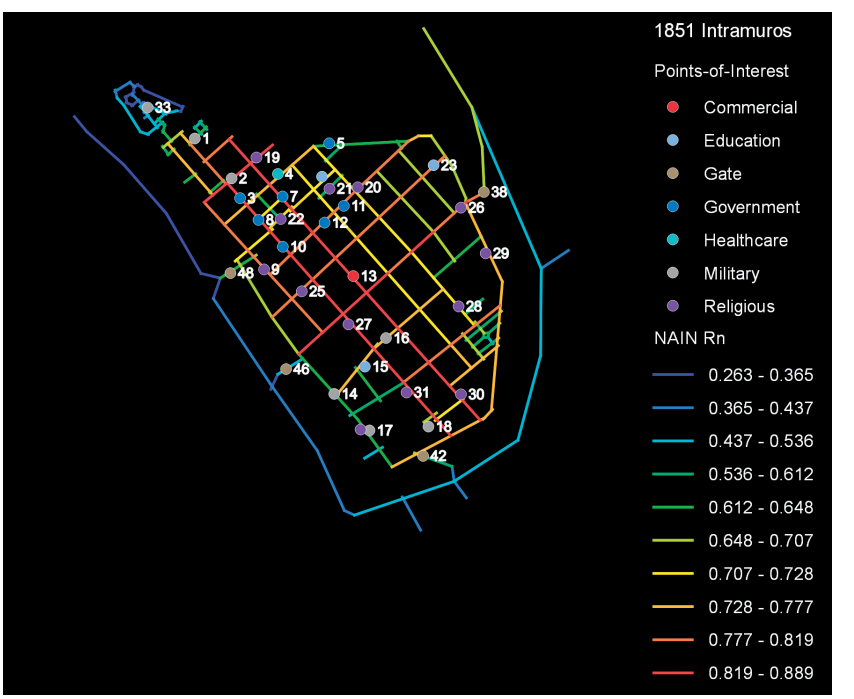

Figure 10. Graph of 1851 Manila, showing Intramuros' points-of-interest with major government buildings located on globally integrated segments of the 1851 Intramuros enclave network, based on Intramuros (1851).

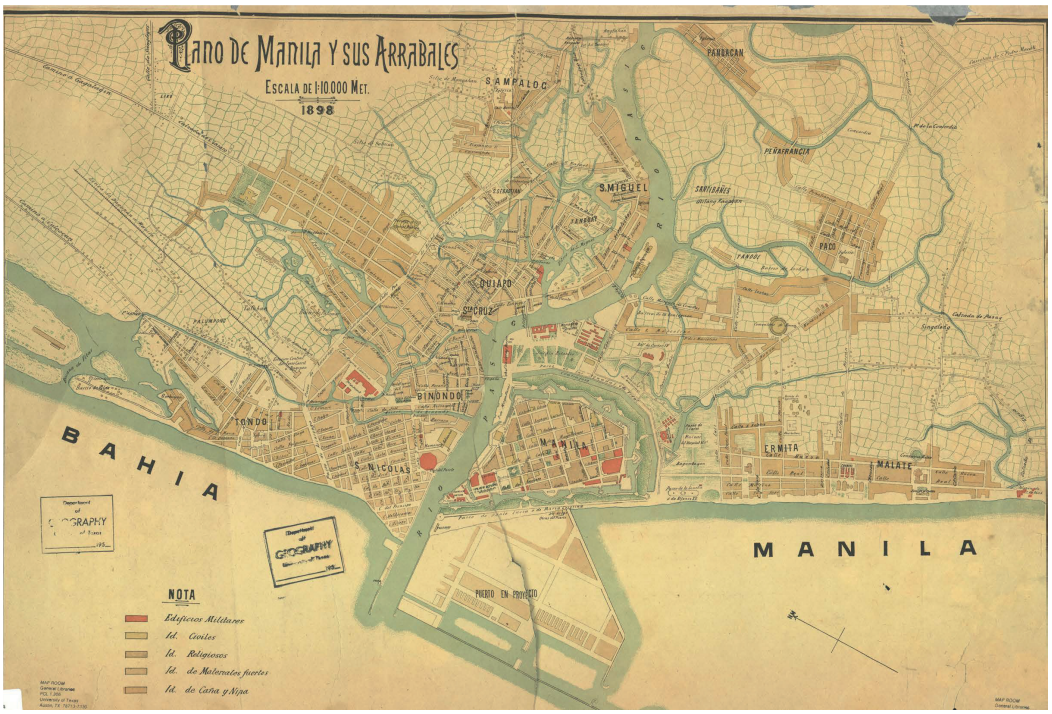

Figure 11. Manila 1898 and its surrounding suburbs. Source: de Gamoneda (1898).

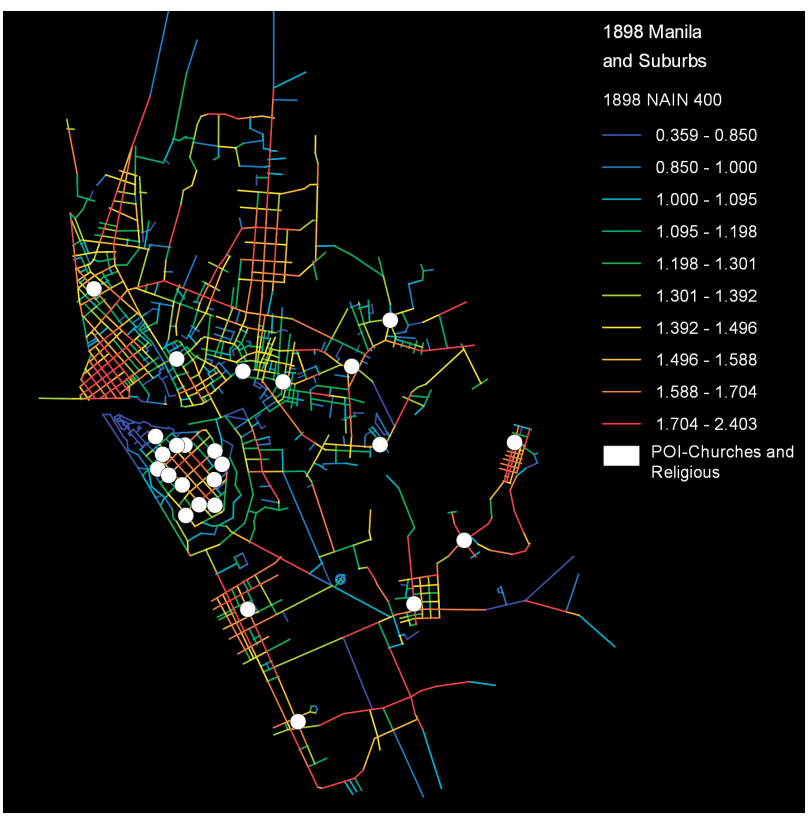

Figure 12. Graph of Manila 1898 showing religious points of interest, with mission churches located on pedestrian integrated segments of the 1898 Network; based on de Gamoneda (1898).

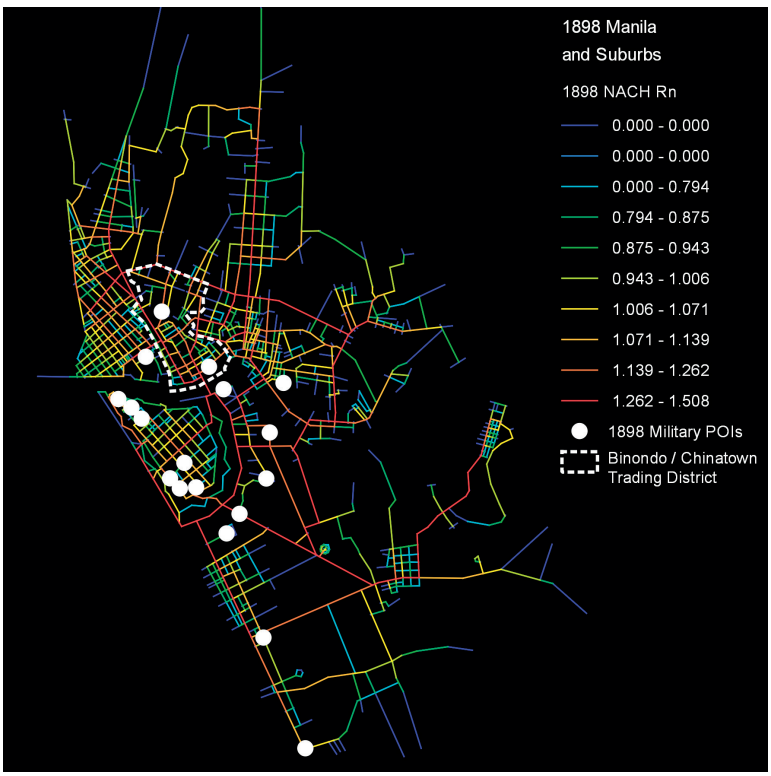

Figure 13. 1898 Manila, showing military camps, located on major global routes of the 1898 Network; based on de Gamoneda (1898).

Figure 14. Manila 1898, showing markets without accounting for access from the river; based on de Gamoneda (1898).

Daniel Burnham's City Beautiful Plan and its partial implementation

After the Spanish-American war, the Philippines came under American control in 1898. Daniel Burnham and his associate Pierce Anderson were enlisted by the colonial government to create a masterplan for Manila. This plan was later expanded beyond Intramuros in an attempt to create a Civic Core inspired by Enfant's Washington, DC (Ocampo 1992; Parsons 1915; Scott 1969; Morley 2014; Figures 15, 16).

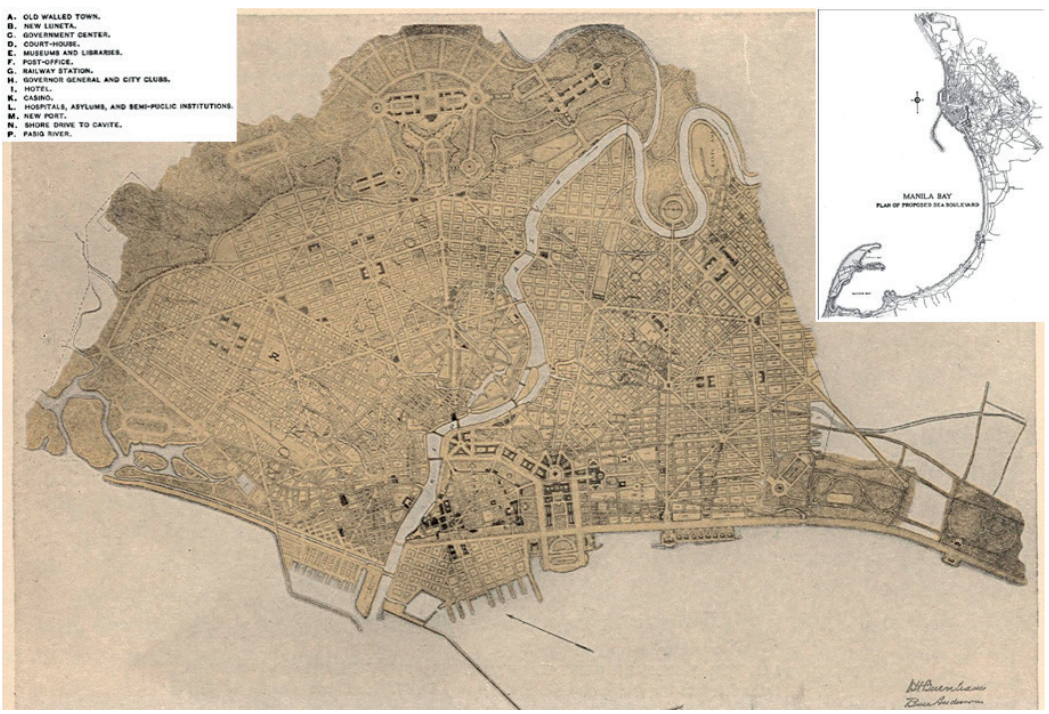

Figure 15. Plans for the development of Manila, submitted to the Philippine Commission by D.H. Burnham, 1905. The essential elements of this plan are the government center, arteries radiating from it, the railway station, and the shore road. Source: Burnham (1905).

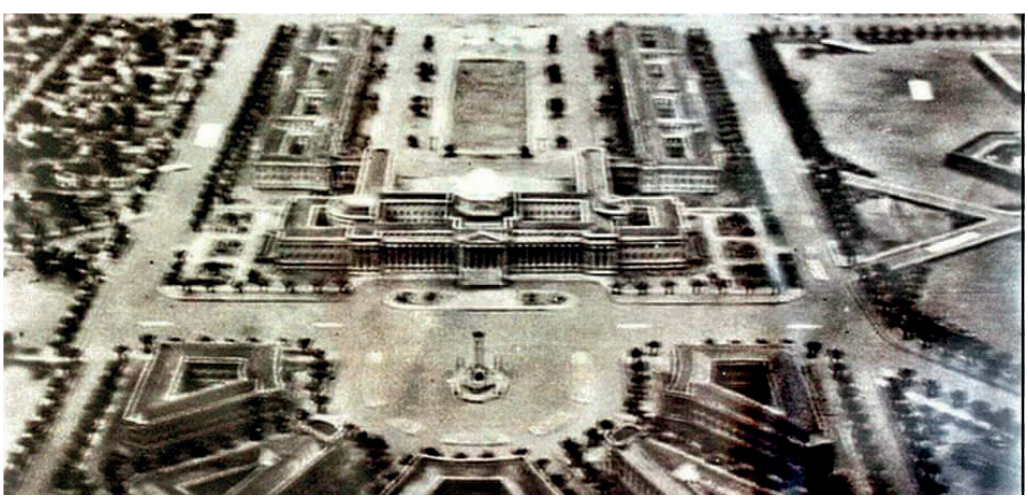

Figure 16. The proposed Capitol Buildings and National Mall to be located beside Intramuros, on what was known as Luneta. Only two of the proposed buildings were constructed: the Department of Agriculture and Department of Finance, which now house the Philippines' National Museum's Natural History and Art Branches. Source: Burnham (n.d.)

Burnham's plan had a radial concentric grid system, focused on the Civic Core, which was supposed to link with the existing fabric of Spanish Manila and assimilate the mission districts founded by the Spanish into a broader whole (Parsons 1915).

The warm colors of street segments on the *integration* graph on a 400 m pedestrian range show how the Burnham Plan expanded the existing network of Spanish mission districts (churches as white dots) to create a new integrated area for pedestrians with several sub-centers (Figure 17).

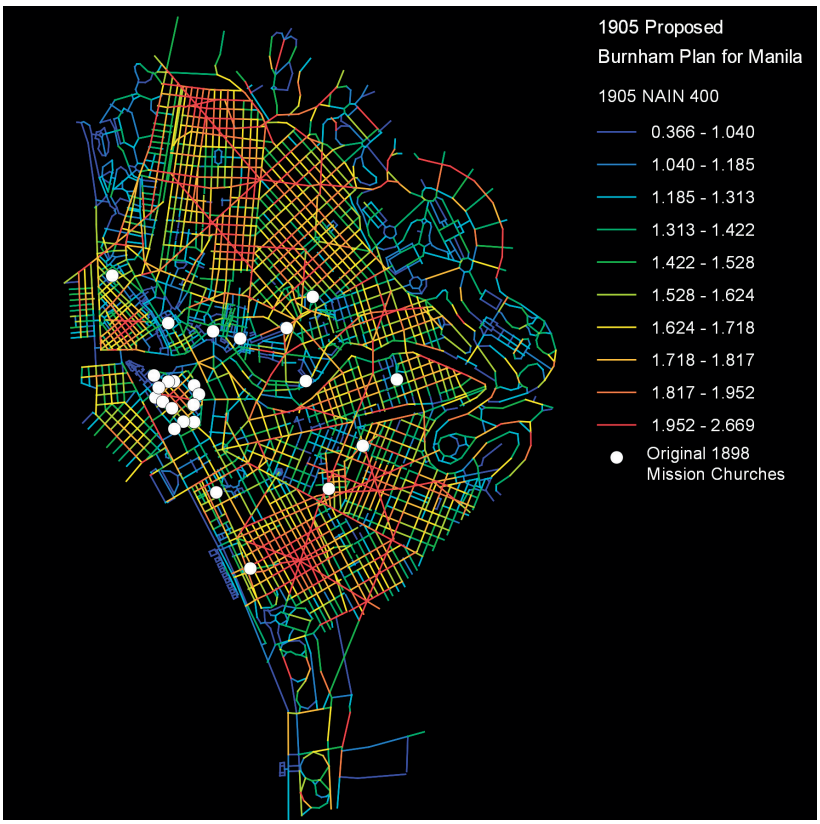

Figure 17. Proposed Burnham Plan for Manila, 1905, showing 1898 Spanish Manila's original mission churches, integrated into Burnham's proposed broader spatial network. Source: Burnham and Anderson (1906)

The warm colors of street segments on the *betweenness* graph of the Burnham Plan show that the sub-centers were interconnected by a network of 10-minute walking routes that were likely to have pedestrian traffic, creating the potential for commercial development (Figure 18).

The warm colors of street segments on the *integration* graph for 2500 m range, simulating local mass transport like the *Tranvia*, shows that the Burnham Plan was likely to divide Manila into two cores to the north and south of the Pasig River (Figure 19). Both Intramuros and the planned Civic Core were effectively side-lined. The divisions last down to the present in the separate north and south university belt clusters. Again, the attempt to impose order had unintended consequences. The creation of a concentric street pattern focused on the Civic Core stimulated local social interaction in other, more accessible parts of the city.

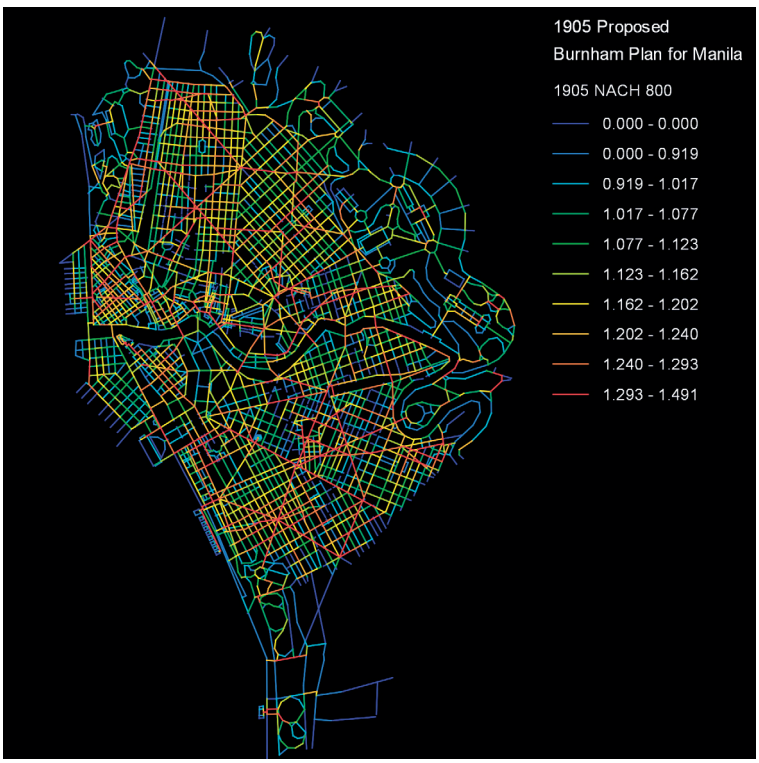

Figure 18. Proposed Burnham Plan for Manila, 1905, showing pedestrian interconnectivity of the proposed radial road network. Source: Burnham and Anderson (1906)

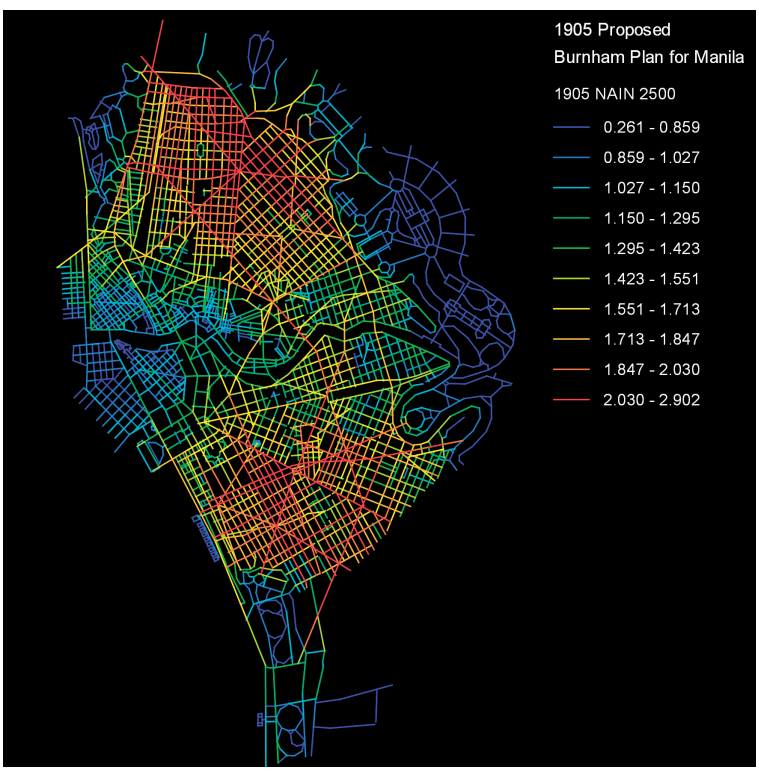

Figure 19. Proposed Burnham Plan for Manila, 1905, showing shift of integration core away from Binondo toward two fragmented integration areas north and south of the Pasig River. Source: Burnham and Anderson (1906)

Burnham's City Beautiful Plan was never fully implemented. It was meant to be a statement of intent and a vision for Manila. The 1945 Map of Manila captures what was completed over the four and a half decades of American colonial rule and city-building (Figure 20).

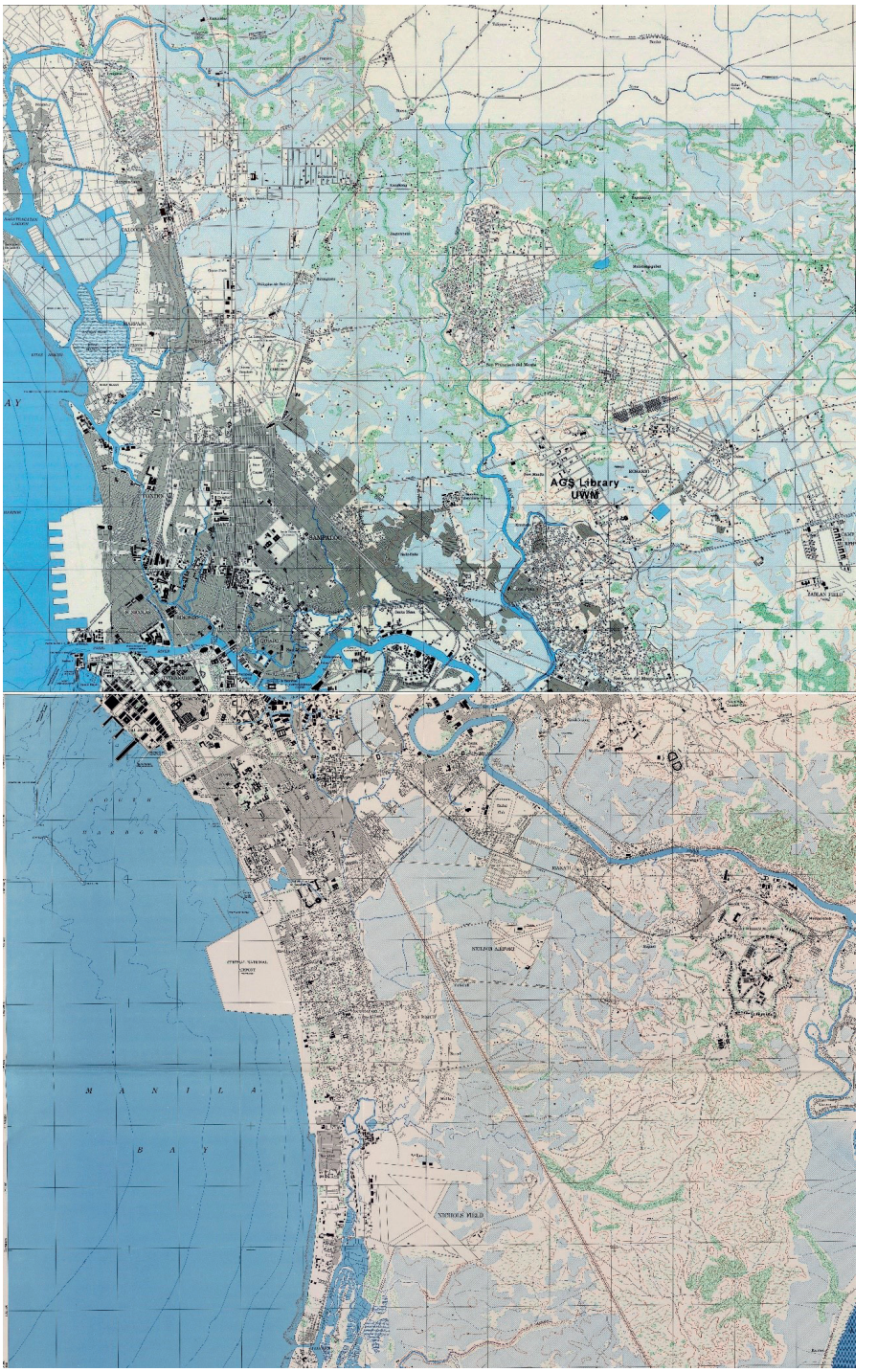

Figure 20. Manila 1945, composited from artillery and air ordnance maps of US Army and US Army Air Force. Source: US Army Map Service (1944–1945).

An *integration* graph of this 1945 map at 2500 m range (Figure 21) shows that Manila did indeed become divided, with two cores indicated by segments in warm colors to the north and south of the Pasig River.

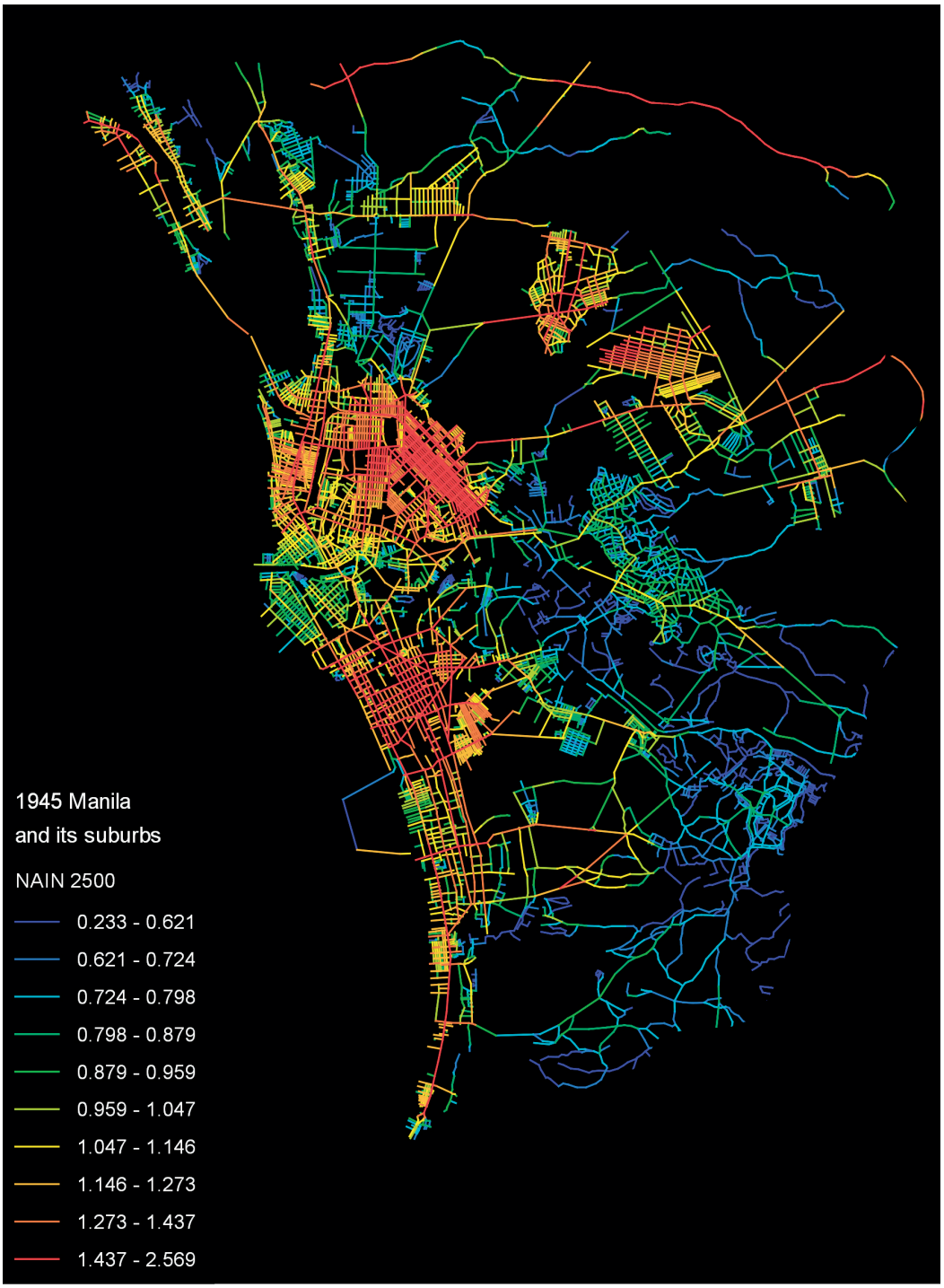

Figure 21. Spatial graph of Manila, 1945, showing integration core beginning to fragment into separate halves; based on US Army Map Service (1944–1945).

The expansion of the city grid to the north and south of Intramuros and Binondo resulted in the old downtown being hollowed-out and new centralities developing in the new suburbs. This fragmentation was partially caused by the lack of new river crossings and the allocation of large tracts of land for industry along the Pasig River that cut off one side from the other.

The southern core facing Manila Bay has a concentration of American-founded points-of-interest and is buffered from the surrounding street network by the Civic Core, Intramuros and the Pasig River to the north, the Estero de Paco to the east, and Burnham's Park No. 1 to the south (Figures 22, 23).

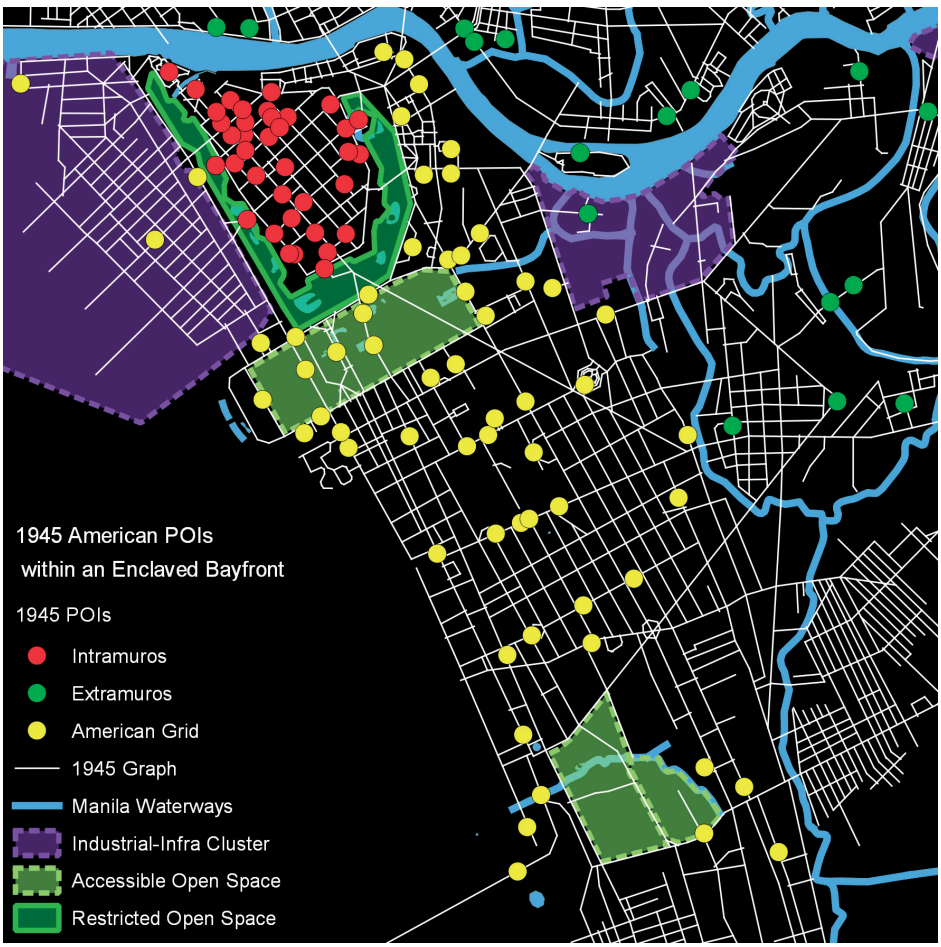

Figure 22. Spatial graph of Manila 1945 showing clustering of American points-of-interest around bayfront area and the land-use/natural buffers surrounding the bayfront; based on US Army Map Service (1944–1945).

In effect, this southern area became an elite enclave without gates or fences, highly valued as a suburban residential address by the elite of that period. However, the accessibility and centrality of this core was also an attraction for commerce. Over time, the palatial homes of Manila's elite gave way to office buildings, commercial frontages, and high-rise towers overlooking Manila Bay.

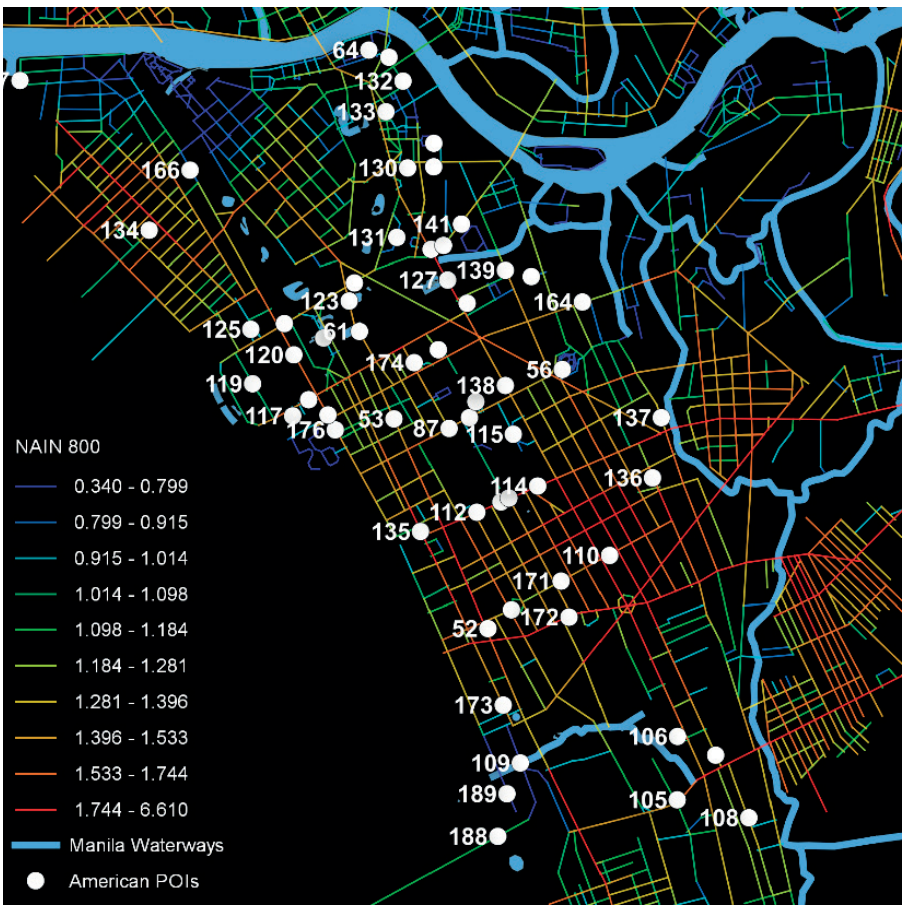

Figure 23. Spatial graph of Manila 1945 with American points of interest within the B\bayfront enclave; based on US Army Map Service (1944–1945).

Metro Manila's post-war suburban expansion

American colonial rule ended in 1946. By the time of the 1967 Map of Metropolitan Manila, the old downtown core had expanded into car-centric suburbs defined by the Epifanio Delos Santos Avenue Ring Road (EDSA/C-4). The zones colored yellow are single-family residential suburbs. American rule may have ended, but the wealthy and the middle class who sought new lives away from the old core devastated by the war were still influenced by the American lifestyle (Murphy and Hogan 2012: 26; Garrido 2013).

The *integration* graph of this 1967 map for 2500 m range of movement shows that the division into north and south cores remained (Figure 26), as there were still few bridges and still industrial zones acting as barriers.

New centralities appeared farther out in Quezon City to the northeast and Makati to the southeast. The government intended to develop Quezon City as a city for workers (Pante 2017), but the *integration* graph for 800 m range shows that its grand avenues and elliptical rotunda created a space that was not pedestrian friendly and hence at odds with this original aim (Figure 30).

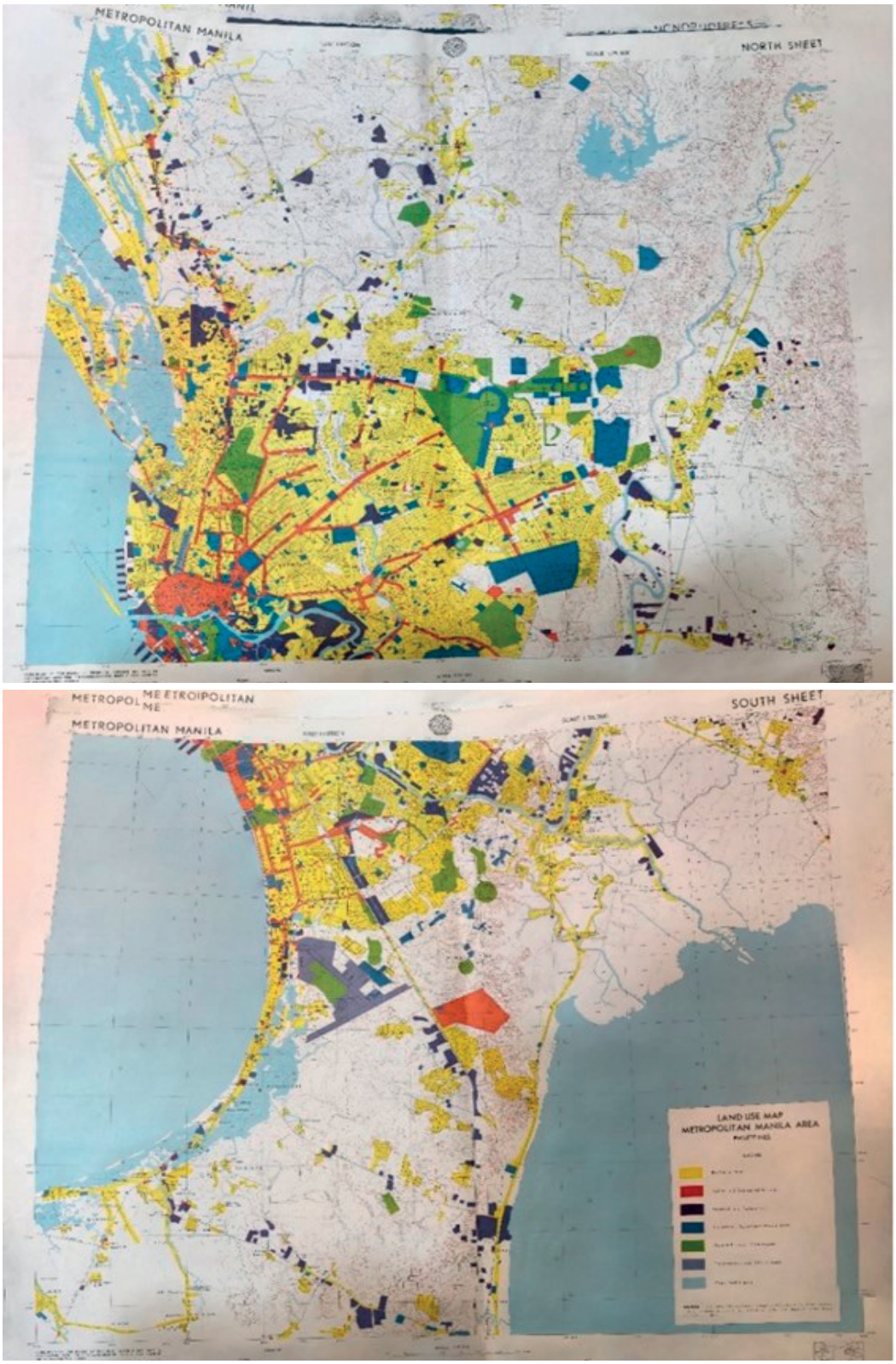

Figure 24, 25. Metropolitan Manila 1967, north and south, land-use and road networks overlaid on topography. Source: Board of Technical Surveys and Maps (n.d.).

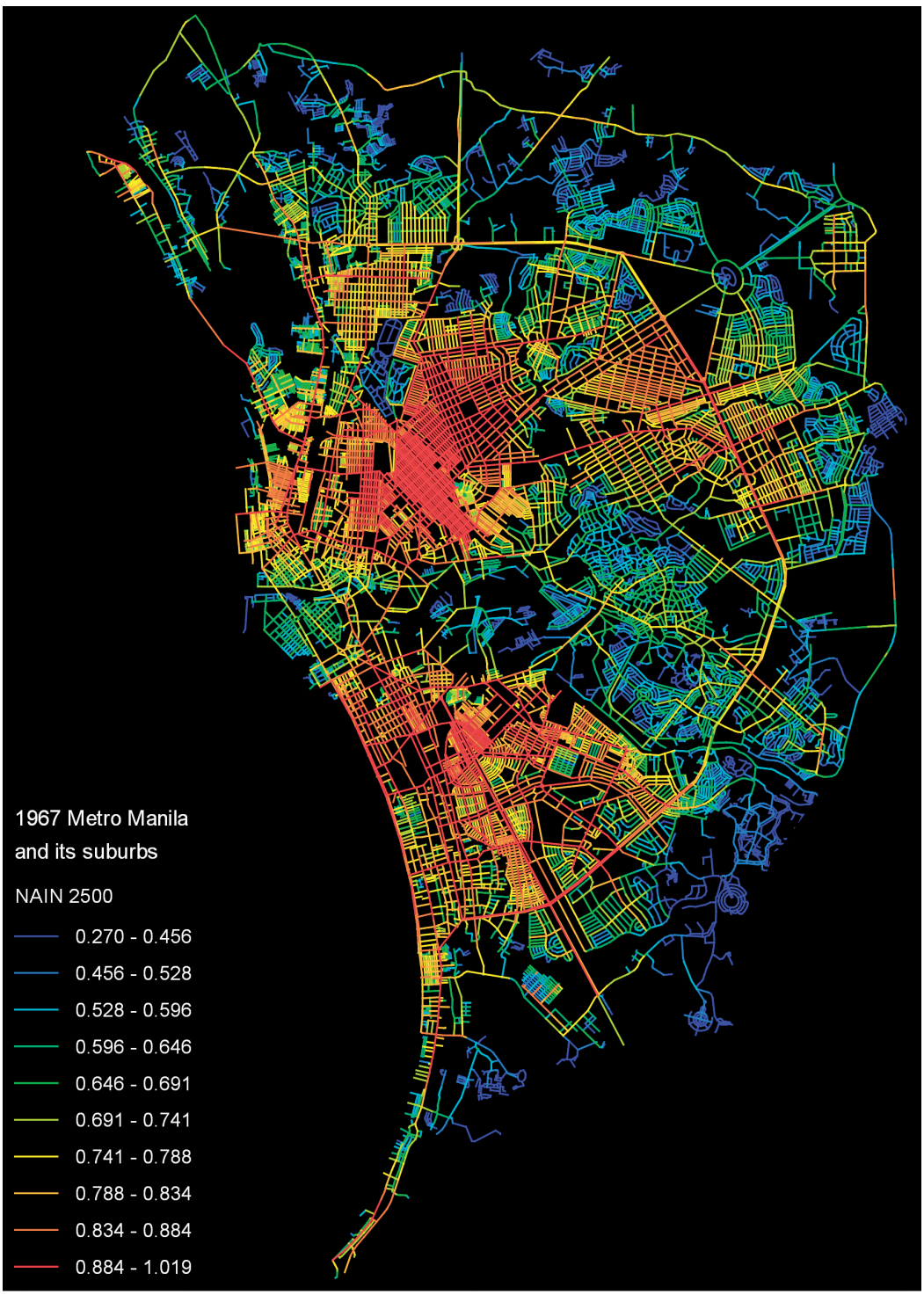

Figure 26. Spatial graph of Metro Manila, 1967, showing fragmentation into north and south integration cores. Source: Board of Technical Surveys and Maps (n.d.).

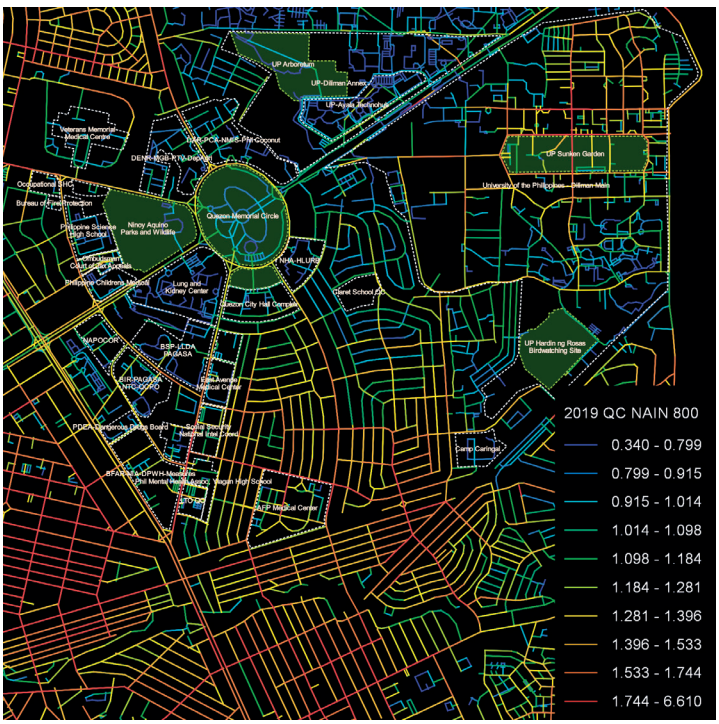

Figure 27. Spatial Graph of Quezon City, Metro Manila, 2019, showing present-day government agencies and their respective enclaves. Drawn by author using OpenStreetMap.

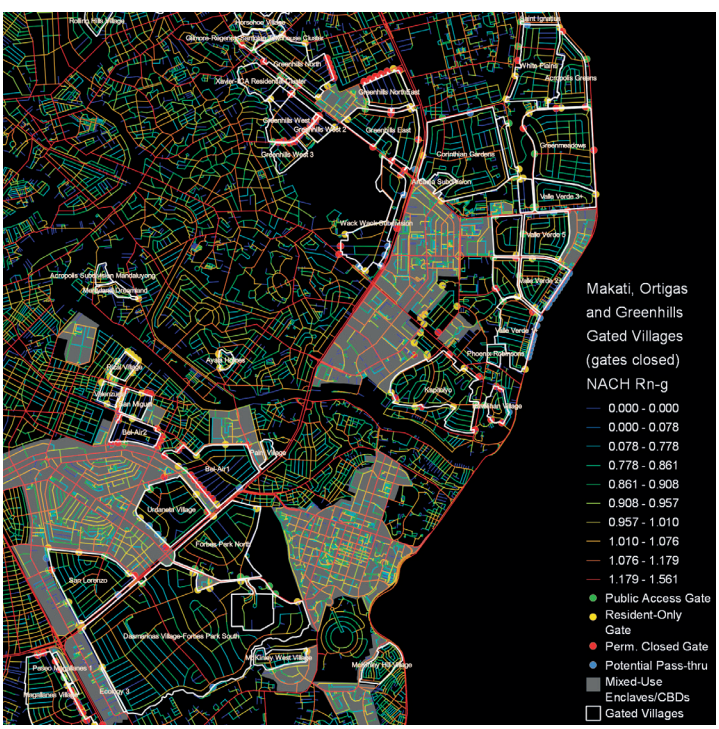

Figure 28. 2019 Spatial graph of Makati, Ortigas, and Greenhills Enclaves. showing Global Integration Centralities under the Gates Closed/Status Quo condition. This represents how access gates suppress the generative capacity of the spatial network within the villages; drawn by author using OpenStreetMap.

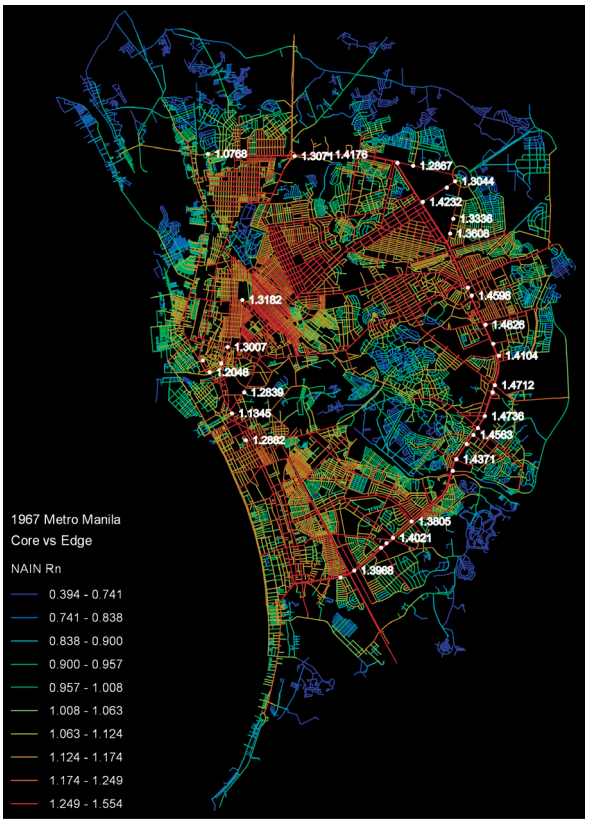

Figure 29. Spatial graph of Metro Manila, 1967, showing higher global integration values along Circumferential Road 4/Epifanio Delos Santos Avenue compared to Manila's original business district of Binondo, American Bayfront district, Ermita, and shopping district of Avenida Rizal. Source: Board of Technical Surveys and Maps (1967).

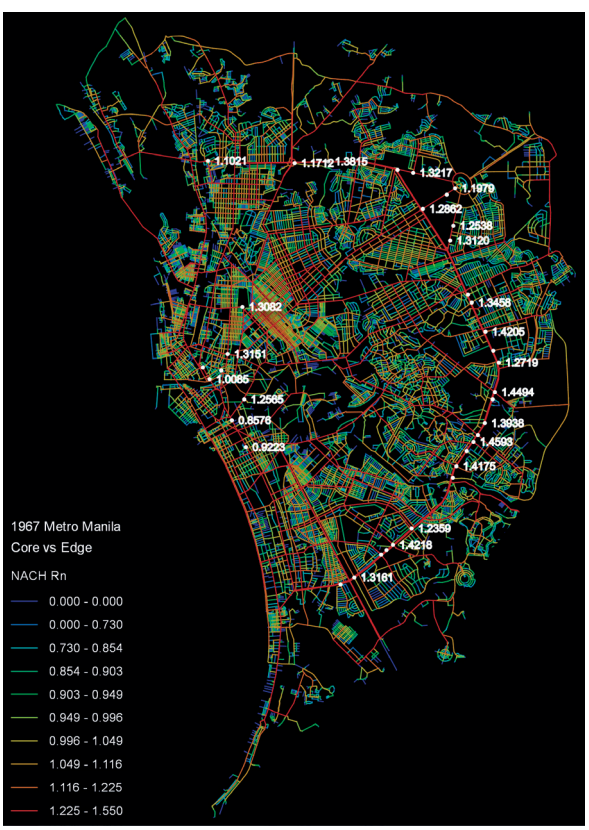

Figure 30. Spatial graph of Metro Manila, 1967, showing higher global route choice values along Circumferential Road 4/Rpifanio Delos Santos Avenue compared to Manila's original business district of Binondo, American Bayfront district, Ermita, and shopping districts of Avenio Rizal. Source: Board of Technical Surveys and Maps (1967).

By contrast, Makati was developed by private enterprise, becoming a new commercial core, surrounded by gated residential villages. In the 1970s and 80s, the suburbs of Greenhills and Ortigas developed on a similar pattern. The *integration* graph for 2019 shows warmer colors for their central business districts, and cooler colors for the segregated, exclusive residential subdivisions with introverted street networks (Figure 28).

Makati and Quezon City both worked as car-centric suburban new cities because of the EDSA/C-4 ring road. The *integration* graph for 1967 shows that EDSA/C-4 became a destination, while the *betweenness* graph for 1967 shows that it also became a popular corridor for movement (Figures 29, 30), resulting in it becoming more attractive than the original urban core.

The attraction of EDSA/C-4 furthered the hollowing-out of Manila's historical core and set the stage for further car-centric suburban expansion into fringe towns to both north and south, leading to longer travel distances. The Filipino middle class abandoned the intimate and local scale of walkable neighborhoods in the pursuit of an American lifestyle in segregated residential zoning made available by cheap oil (Roderos 2013). They now only sampled the experience of walkable neighborhoods on school field trips to Intramuros and Rizal Park or visits to walkable cities abroad. The historical core lost its vibrancy, parts being "de-gentrified" into informal slums in the absence of liveable public housing (Recio 2013).

Latent centralities in Metro Manila's existing suburban fabric

The 2004 Land Use Map of Metro Manila (Figure 31) shows the expansion of Metro Manila to north and south in single-family residential subdivisions (the yellow zones) with commercial corridors of strip mall and big-box mall developments and older-style retail streets.

An *integration* graph at 2500 m range of movement on the 2019 map shows the latent spatial patterns within Metro Manila's residential suburbs and suggests what is needed to create a 15-Minute city (Figure 32). The areas in warmer colors from yellow to red are more accessible within a 2500 m journey, roughly equivalent to fifteen minutes. These are mostly along main routes which are heavily trafficked by vehicles and which are often the sites of the car-centric strip mall and big-box mall developments that have become common outside the old city core. These also correlate to the red areas of commercial land-use on the 2004 Land Use Map of Metro Manila (Figure 31). This analysis also highlights interior street networks within the yellow residential zones in the 2004 map.

This hints at the latent local centralities within the gated residential subdivisions. The warm colors (yellow to red) on an *integration* graph at 1200 m range of movement of the 2019 map denote areas with good pedestrian access within the yellow residential areas (Figure 33). These include the existing commercial zones and mall developments along the major roads, but also spaces within the residential areas which are within 1200 m or a fifteen-minute walk.

This analysis suggests that something of the fine-grained networks present in Metro

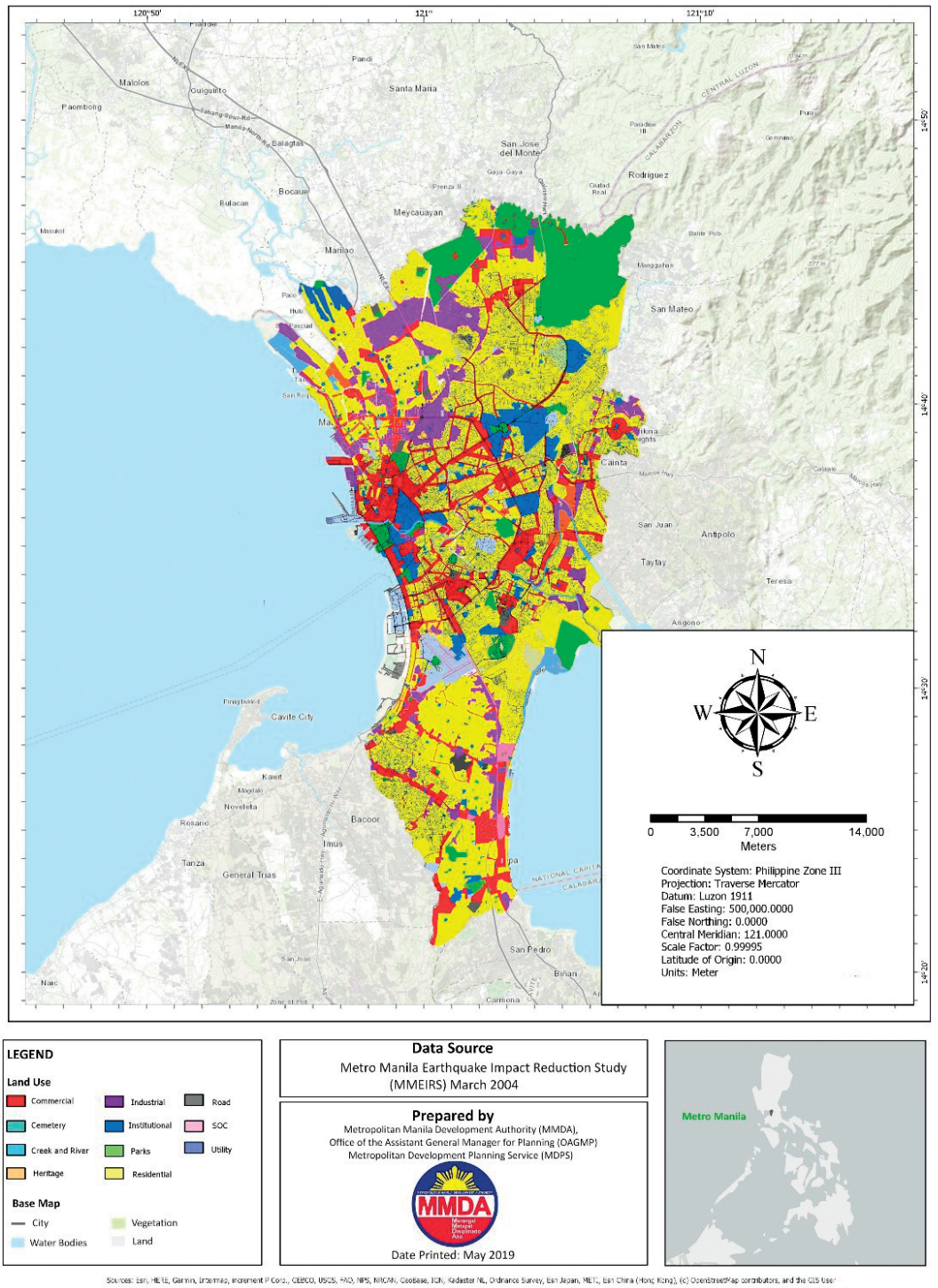

Figure 31. Land Use of Metro Manila, 2004. Source: Office of the General Manager for Planning (2019).

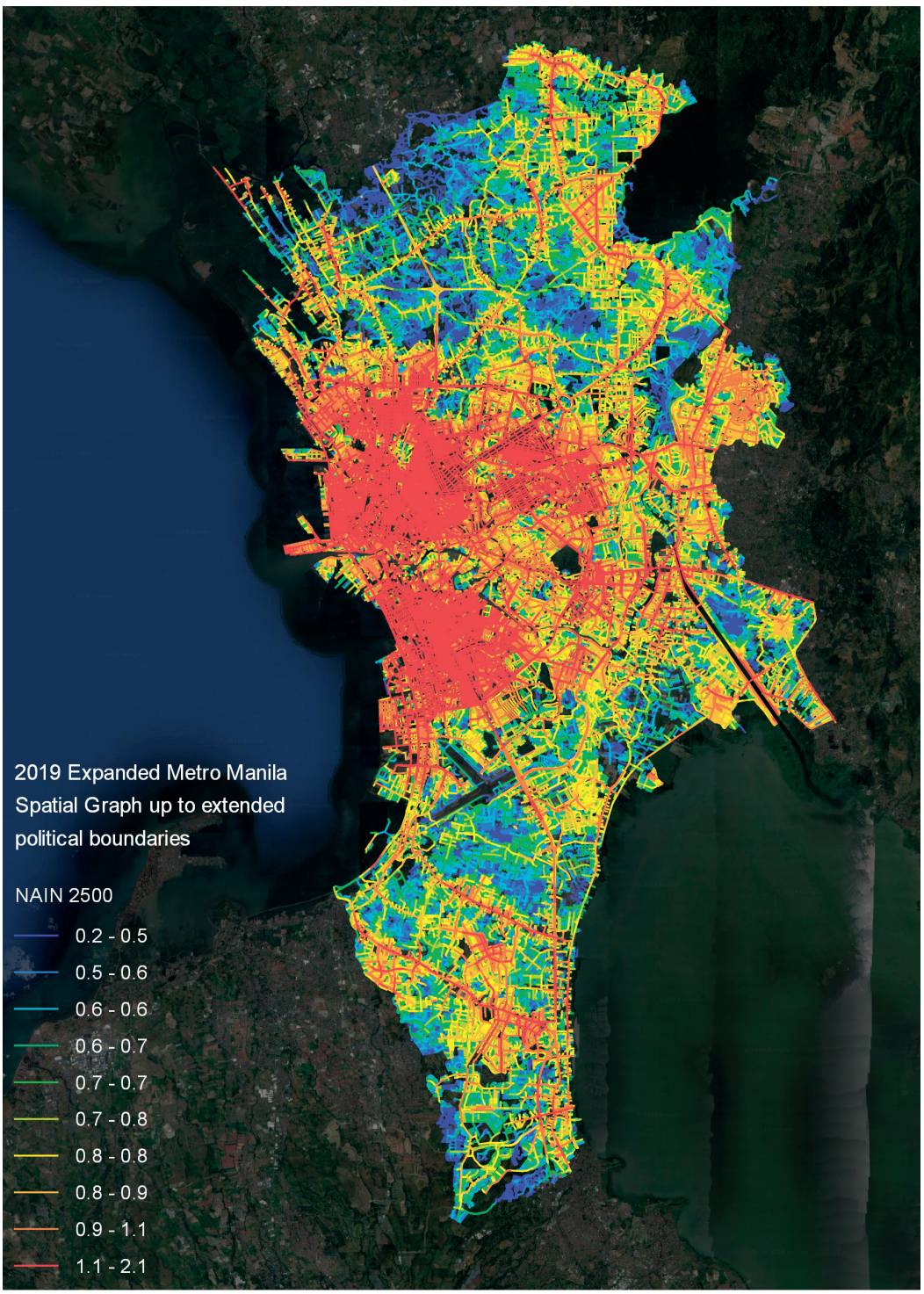

Figure 32. Spatial graph of Expanded Metro Manila, 2019, showing local centralities for movement of 2500 m range; drawn by author using OpenStreetMap.

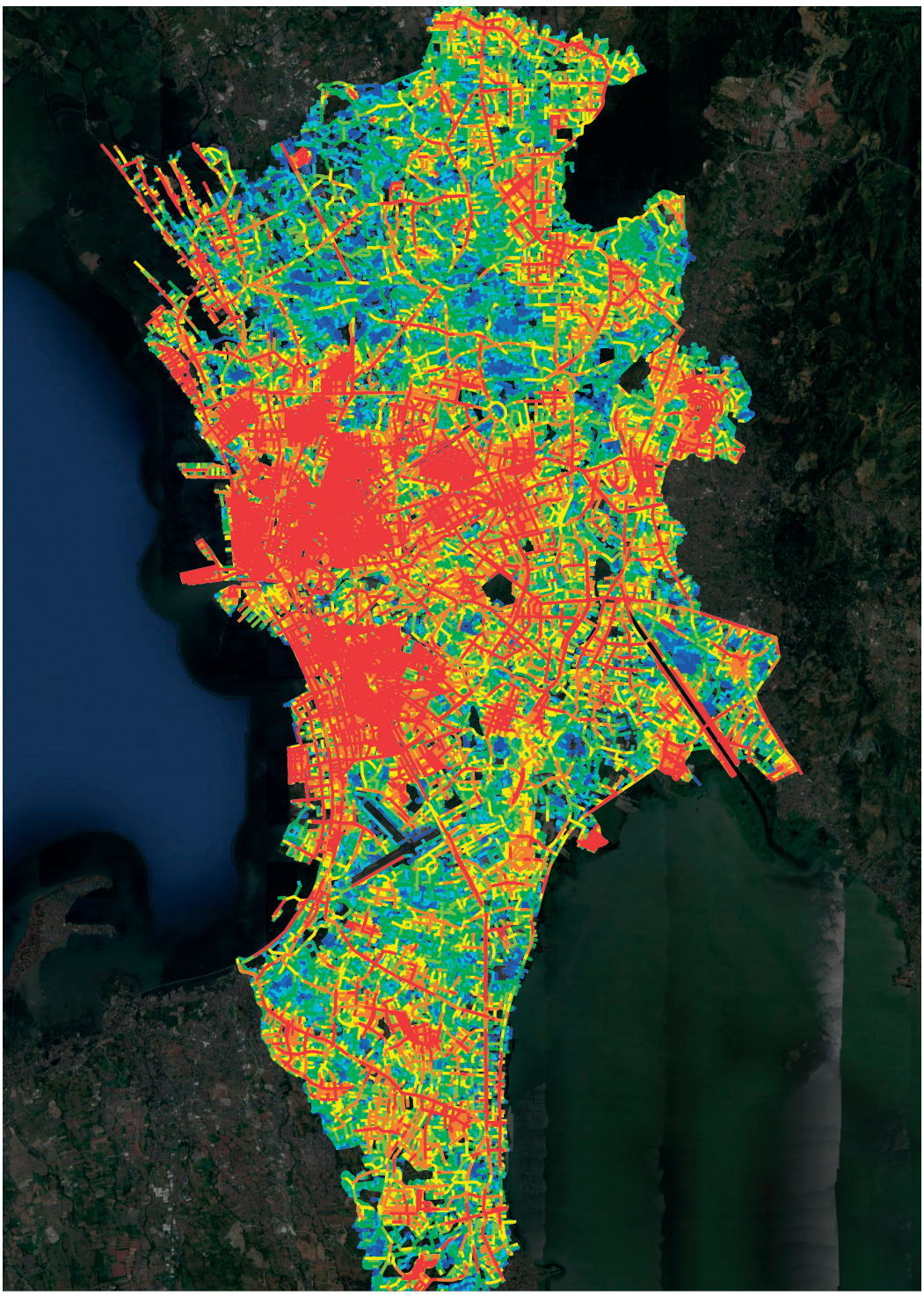

Figure 33. Spatial graph of Expanded Metro Manila, 2019, showing local centralities for movement of 1200 m range, drawn by author using OpenStreetMap.

Manila during the Spanish and American colonial periods can be rescued by a scaled approach to planning and retrofitting the built environment. This will require new policies on land-use, density, and security policies. Security cordons may have to be dismantled to improve access. Restrictions of commercial land-use and zoning density may need to be relaxed. Parking may have to be outlawed to allow the streetscapes within these areas to be retrofitted to encourage walking, cycling, and more use of public transport.

Conclusion

During the Spanish colonial period, Intramuros with its clustering of different land uses and its permeable grid of streets and interconnected plazas was a walkable 15-Minute city. The various mission districts were also locally integrated for pedestrians and centered around their mission church. the buffering of Intramuros allowed the development of a second spatial network focused on Binondo. The whole city, around 5-6 km end-to-end, was well integrated by the *tranvia* network that connected the various local mission areas with Intramuros and Binondo.

The Burnham Plan created a new Civic Core beside Intramuros with a concentric grid that assimilated the mission church districts and created new pedestrian-friendly neighborhoods. At the same time, the Burnham masterplan created industrial areas alongside the Pasig River which, with the lack of bridges, divided the new city into northern and southern segments.

The post-1945 expansion of Manila was shaped by the Epifanio Delos Santos Avenue (EDSA/C-4). The city expanded to the northeast to Quezon City, intended as a new grand capital of boulevards and avenues for workers, and southeast to Makati, a cluster of gated residential villages for Manila's elite and middle class. Both new developments were car-centric and very suburbanized. They accentuated the north-south division of Metro Manila. Along with EDSA's value as a through route, they contributed to the hollowing out of the historical core.

Metro Manila continued to sprawl further to the north and south, increasing travel distances, and creating a very car-centric city with inaccessible localities. However, space syntax shows there are latent centralities within the suburbs which have the potential to be retrofitted in line with the concept of 15-Minute cities.

New Urbanism and the 15-Minute City are toolboxes of concepts for urban planning. Space syntax can be used to sharpen understanding of how both New Urbanism and the 15-Minute City can be implemented, especially by retrofitting existing communities. The analysis of Manila's historical urbanism by space syntax shows patterns of localization in a suburbanized metro region, going beyond the aesthetic historicism of New Urbanism, and the application of circular travel ranges used in the discourse on the 15-Minute City.

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