
Manila: City Beautiful Lost?

A Historical and Configurational Analysis of Daniel Burnham's Proposed 1905 City Beautiful Plan

Leandro Nicholas Rañoa Poco¹

leandro.poco.18@alumni.ucl.ac.uk, leandro.poco@gmail.com

Abstract

Metro Manila's contemporary socio-spatial inequities and problems with urbanization are usually traced by popular discourse to the incomplete implementation of Daniel Burnham's City Beautiful masterplan. This unfinished work is further compounded by the poorly managed post-war reconstruction and haphazard growth of the city into a metropolitan region after independence from the United States. This study reviews the relevant historical timeframes that define the typo-morphological stages of Manila's spatial development. These stages then become the basis for this study's use of quantitative spatial network analytical methods under space syntax theory. This methodology is used to understand the Burnham Plan's spatial network vis-à-vis the city's prior conditions, and the succeeding post-(non) implementation effects of the Burnham Plan on its eventual expansion outside of the original city limits. This uncovers the underlying spatial configuration of the Burnham Plan's spatial network, showing how the intent to create a civic core does the opposite and leads to the shifting of spatial network centralities away from the civic spaces proposed by Burnham, and how it creates new latent socio-spatial enclaves in the city. This foreshadows the fragmentation of Metro Manila's broader spatial network centralities as it grows out of its city limits. This study calls the critical attention of Philippine planning and architecture to add quantitative nuance to the contemporary discourse on Burnham's City Beautiful Plan for Manila, hopefully to move on from it, and forward to the use of similar quantitative methods in not just researching about, but in planning and designing Philippine Cities.

Keywords: Space Syntax, Daniel Burnham, William Parsons City Beautiful, Manila, Intramuros, Enclaves, Encomienda, Hacienda, Reducciones

Leandro Poco is a registered Architect/Environmental Planner. He is a partner of Leonardo A. Poco & Associates, Architects. He completed his MSc Space Syntax: Architecture and Cities degree at the UCL Bartlett School of Architecture (2019); and his MA in Urban Design at the National University of Singapore (2008)

I. Introduction

A. Background

Manila, the capital of the Philippines, is a layering of growth and decay over the centuries. What started out as an out-post for Sangley Chinese, Tagalog, and Malay-Muslim traders, became the seat of power for the Spanish rule of the Philippines from 1571 to 1898. The country was then ceded over to the Americans, who ruled for the next 47 years until granting Independence after World War 2 to Filipinos on July 4, 1946.

The Americans brought the renowned planner, Daniel H. Burnham, to plan and project Manila's future growth outside its Spanish Walled City and mission suburbs. He sought to incorporate City Beautiful principles into the new masterplan, and define a civic core with a National Mall, that was to be the symbol of America's colonization of the Philippines—reproducing democratic values through the grand neo-classical architecture and civic spaces it proposed (Karnow, 1989 and Vernon, 2014).

The Proposed Plan aimed to facilitate transport and communication throughout the city with a radial-concentric street network patterned after Washington DC and Paris. It was completed on paper in 1905 but was revised by Burnham's successors during the American occupation as it was implemented with the growth of the city, until Manila's destruction in World War 2, and subsequent reconstruction and growth after the war.

Present-day Metro Manila is a hollowed-out urban region with a blighted and congested core. Most economic activity has moved to the business districts outside the traditional center of Manila (Michel, 2010). These metropolitan disfunctions are often seen by local architects and planners as the result of incomplete implementation of the Burnham Plan, compounded by poorly managed post-war reconstruction and haphazard growth after Independence.

B. Statement of the Problem

Metro Manila's state of urban disfunction has created a sense of resignation at the challenge of fixing it. Philippine President, Rodrigo Duterte, has declared it a dead city in 25 years (Ranada, 2017), and is pushing for decentralization of development away from the capital (Flores, 2018), his administration is proceeding with a new government center in Clark, Pampanga, a vast former US airbase in the Central Luzon Region to the North of Manila (Schnabel, 2018).

Manila: City Beautiful Lost?

A Historical and Configurational Analysis of Daniel Burnham's Proposed 1905 City Beautiful Plan Poco

This desire for *tabula rasa* has fostered a tone of historical romanticism in local discourse. Alcazaren (2003) talks about the virtues of Daniel Burnham's City Beautiful Plan and its mis-implementation. Palafox (Macas, 2014) and Soliven (2018) insist that for Manila to recover its lost prestige, it should rediscover and implement the wisdom of Burnham's original plan.

C. Significance of the Study

As Murphy and Hogan (2012) point out, Metro Manila's current disfunctions have historical roots. While narrated in historical literature, these have not been analyzed using space syntax methods. This study intends to provide a configurational analysis of these narratives, to show how Metro Manila's spatial network and society reflexively influence each other throughout history—creating the latent spatial reasons for today's hollowed-out and blighted core.

D. Research Questions

The main research questions of this study are as follows:

1. How did the 1905 Burnham Plan affect the existing spatial network centralities and enclaves of Spanish Manila (Pre/1898)?
2. How was the 1905 Burnham Plan implemented and what are its effects on Manila's spatial network centralities and enclaves as it grew and evolved during the American period (Up to 1945)?
3. How did Manila's surrounding territories (encomiendas) affect the implementation of the 1905 Burnham Plan, as the city began to outgrow its original limits (1945 and beyond)?

II. Literature Review

A. Roots of Metro Manila's Enclavization

Neoliberal economic thought and economic austerity have seen the rise of privatization and enclosure of the public realm into private property throughout the world. While this appears to be a contemporary phenomenon affecting all cities subject to the flows of global trade and economic policy, Murphy and Hogan (2012) point to the Spanish Encomienda system (Doeppers, 1972) and the subsequent failure of American secularization and land reform of Friar Lands, as the historical root of the privatization and enclavization of Philippine territory, and of Metro Manila's privatized edge cities and gated villages.

Spanish colonial administration imposed a semi-feudal division of agricultural territory outside of the Reducciones Church Plaza-centered towns and cities (Doeppers, 1972). This is a prototypical pattern found throughout the Philippines, and is centered in Spanish Intramuros, with its exclusionary nature and development and its surrounding mission arrabales or suburbs, such as Binondo, San Nicolas, Quiapo, etc. documented by Armengol (1958), Quirino (1971), Shioda et al. (2012), and Jimenez-Verdejo et al. (2015). American takeover and colonial urban development

following Daniel Burnham's City Beautiful Plan and subsequent deviations to it are discussed by Duque (2009), Morley (2014), Vernon (2014), Kirsch (2017), and Morley (2018).

B. Social Reproduction

Hillier (2001) discusses "Cities of Reproduction" as a spatial means to re/produce society. In the case of Teotihuacan instead of configuring around the daily socio-economic life of its occupants as an organically formed city did, its grand axis forms a "monumental core." This imposed a synchronic space-time order through ceremonies and practices that emphasized the societal hierarchy and power of its leaders.

Oramas-Dorta's (2012) study of Planned Political Capitals includes Washington DC (from which Burnham draws considerable inspiration) as its earliest historical example, amongst the new modern capitals of Brasilia, Abuja, and Astana. It points out that their respective "monumental cores" are not activated as part of the daily socio-economic functioning of their respective urban fabrics—and instead belong to the background network of socially conservative spaces that preserve culture through ceremonial events.

Conversely, this study points at how spatial networks, perhaps as a sign of "self-correcting" and filling a market demand, develop organic centralities (Hillier, 1999), even in neighborhoods not intended to be vibrant districts.

C. Space Syntax: Axial Lines and Graphs

This paper examines the above historical and socio-spatial phenomena, using the methods that form space syntax theory's analysis of spatial configuration. Hillier and Hanson (1984) discuss the fundamental derivation of space syntax methodology. They present how settlements have organically developed, and how certain spatial phenomena take shape.

They then propose the use of Axial Lines to represent and analyze these settlements as an interconnected network of spaces (See Fig. 1, p. 17). Axial lines represent the longest, straightest lines that pass through any system of spaces, as abstractions, they are useful in simplifying the underlying spatial system through the built environment. Emo (2014) has tested and illustrated the soundness and the cognitive roots of the axial lines as a method of representing space through a city, by testing and showing how humans visually perceive space, through the axial lines (See Fig. 2, p. 17).



Figure 1. Barnsbury Axial Graph

Source: Al-Sayed, K, K. Turner, A., Hillier, B., Iida, S., Penn, A. (2014), *Space Syntax Methodology*, London: UCL Bartlett School of Architecture, p. 62.

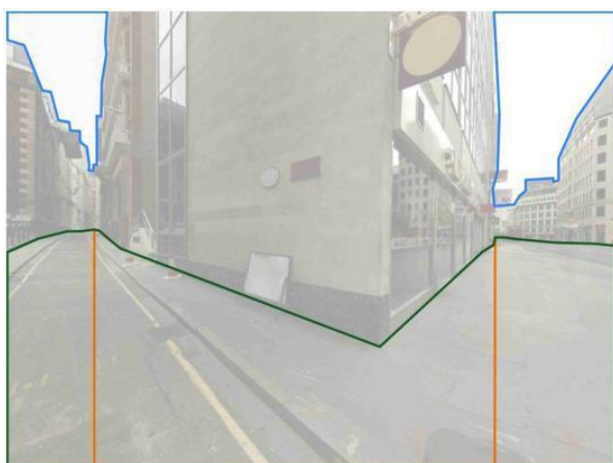


Figure 2. Axial Lines shown overlaid onto streetscapes.

Source: Emo, B. (2014), *Seeing the axial line: evidence from wayfinding experiments. Behavioral Sciences*, 4(3), pp.167-180.)

Each street or path through a public space is represented as an axial line (b) and is then counted as a node (c), which, when grouped together according to their adjacent connections (d), for a network that can be mathematically analyzed (Hillier and Hanson, 1984, see Fig. 3, below).

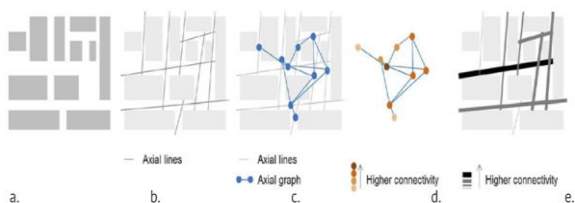


Figure 3. Translation from streetscape to axial lines, to spatial graph

Source: Al-Sayed, K, K. Turner, A., Hillier, B., Iida, S., Penn, A. (2014), *Space Syntax Methodology*, London: UCL Bartlett School of Architecture, p. 62.

D. Space Syntax's Centralities, Movement Economies, and the Order and Structure of Networks

This paper examines the above historical narratives using the methods that form space syntax theory's analysis of spatial configuration. Foundational to space syntax is the concept of natural movement (Hillier et al, 1993) – in which all things being equal, how space is configured influences its probability to generate pedestrian and vehicular movement, and correspondingly, social copresence and behavior.

The potential for movement in cities is categorized according to two kinds of applied graph theory centralities (See Fig. 4, below). The closeness centrality, also known as integration, measures the probable capacity of the spatial network to foster movement towards specific close or integrated locations. The second is the betweenness centrality, also known as choice, which measures the probable capacity of the spatial network to generate through movement between any 2 points (Hillier et al, 1993).

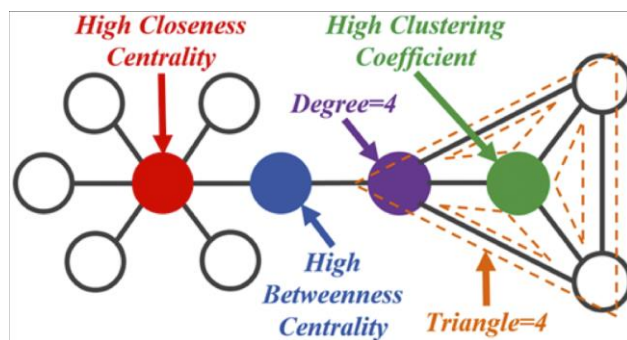


Figure 4. Applied Graph/Network Theory Centralities

Source: Leskovec, J., (Accessed 11 August 2019), CS224W: Social and Information Network Analysis, <http://cs224w.stanford.edu> HYPERLINK "<https://web.stanford.edu/class/cs224w/handouts/15->

These concepts are then used to describe cities as movement economies (Hiller, 1996), wherein cities also probabilistically create parts vs. whole relations, by virtue of the variances of activity in (closeness/integration), and movement through (choice/betweenness) certain places which spatial configuration encourages or discourages.

This describes the formation of a generic dual network (Hillier and Vaughan, 2007) composed of the foreground network on which generative micro-economic activity fosters exchange and interaction, and the background network, which is conservative in how it maintains social and cultural relations within residential communities.

This adds nuance to Hillier's (1999) discussion of Centrality as a Process, wherein he not only relates the relationship between land use and other factors to the idea of configurational centrality in cities, but also highlights how centralities grow, migrate, shift, or diffuse over time as the foreground and background networks grow and develop, and how a city's spatial network is both a combination of imposed order and underlying structure.

Manila: City Beautiful Lost?

A Historical and Configurational Analysis of Daniel Burnham's Proposed 1905 City Beautiful Plan Poco

Hanson for London after the great fire of 1666 (1898) and Karimi for Persia's ancient cities (2012) discuss how imposed localized order differs from global structure and how the two concepts intertwine and recede as one surfaces. Both discuss how attempts to impose order on seemingly disorderly spatial fabrics fall apart as underlying centralities re-emerge, forming a spatial structure to the network that serves to underpin socio-economic phenomena.

III. Methodology

A. Historical Time Frames

The following years are identified as snapshots for defining the historical development of the region being analyzed. Historical base maps corresponding to these years shall be used for tracing and analyzing the spatial network graphs:

1. **1898 - End of Spanish Colonial Rule / Transition to American Occupation.** This shows the extent of Spanish colonial city and settlement building around Intramuros.
2. **The Proposed 1905 Burnham Plan.** This is a theoretical scenario, assuming full build-out of the Burnham Plan.
3. **1945 - End of American Colonial Rule.** This shows the extent of American colonial city and settlement building, the adaptations and revisions to the original 1905 Burnham Plan, and the start of expansion / suburbanization outside Manila's original limits.

B. Geographical Limits

From the overall spatial analysis of Metro Manila (See Fig. 5 upper right), one could see a spatial integration core (warm colors) formed within the edge of Circumferential Road 4 or Epifanio Delos Santos Avenue (EDSA). This shall be the focus for this study, as this core area is the setting for Manila's historical development and shall be the limit of spatial network and overlay analysis.

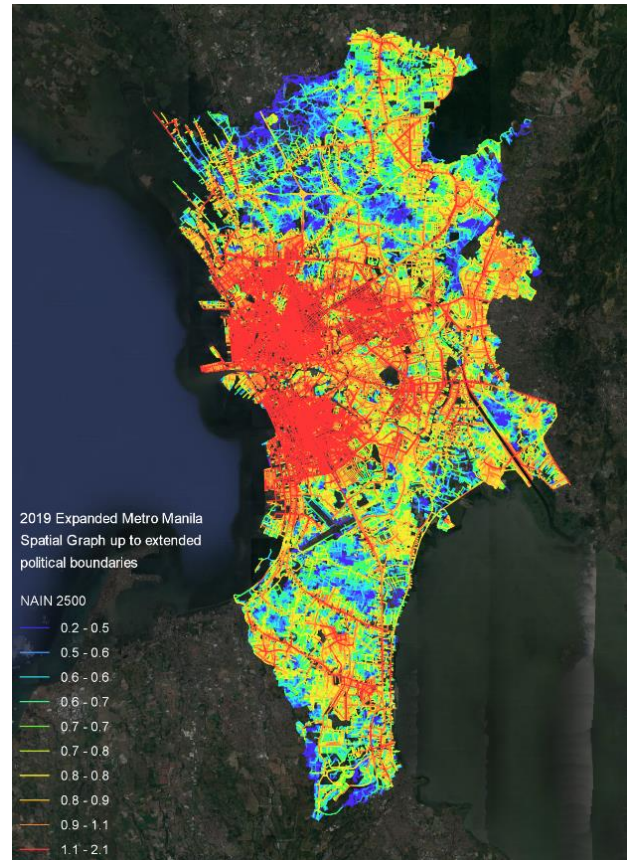


Figure 5. 2019 Spatial Graph of Metro Manila: NAIN 2500, showing extent of spatial network up to Metro Manila's present-day political boundaries.

Analyzed using *Depthmap X* by UCL *depthmap X* development team (2018), Drawn by author using QGIS from OpenStreetMap, (Accessed 20 February 2019), [HYPERLINK "http://download.geofabrik.de/asia/philippines.html#"](http://download.geofabrik.de/asia/philippines.html#)

C. Methodological Framework:

This study traces segment graphs from the abovementioned historic maps, which are then overlaid and compared with Metro Manila's existing street network for comparison. Using space syntax's method of angular segment analysis (Turner, 2000; Turner, 2001; Turner, 2005; Dalton, 2001; Turner, 2007; Charalambous, N. and Mavridou, M., 2012), measures of Normalized Angular Integration (NAIN/closeness centrality) and Normalized Angular Choice (NACH/betweenness centrality) (Hillier et. al, 2012) are produced for the traced historical spatial networks. These values vary from local/pedestrian to macro/vehicular scales.

The values derived from the spatial analysis of these timeframes are to be compared against various points-of-interest (Yang, 2015), including historical landmarks and enclave entrance thresholds and boundaries found in the historical maps. These are aggregating data that symbolizes the socio-spatial narratives from reviewed historical literature (see Fig. 6 p. 19).

These are analyzed using descriptive statistics and are discussed to highlight the differences in socio-spatial configuration between portions of the spatial network that are within and outside the boundaries of Metro Manila's enclaves. The historical analysis presents the repeating patterns of enclave urbanism that inform today's present-day configuration.

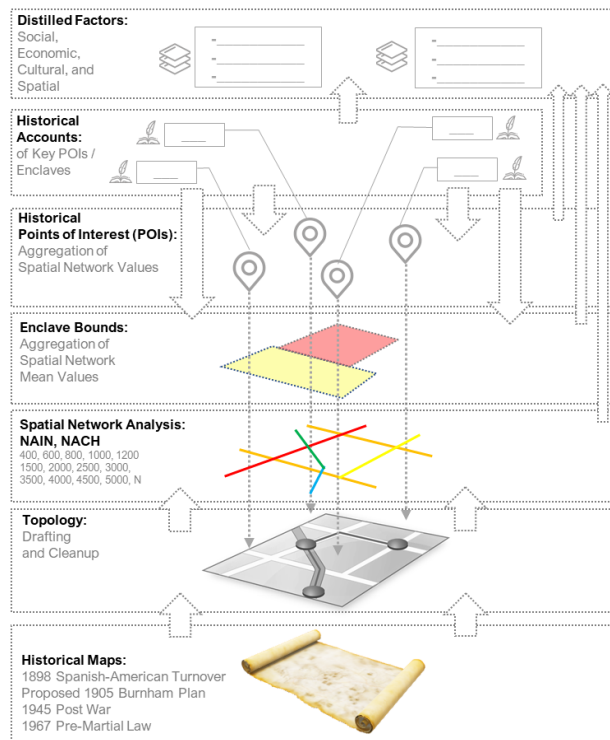


Figure 6. This study's framework for assessing Metro Manila's Historic Spatial Configuration Showing historical maps and historical accounts as sources for data aggregation and descriptive statistical analysis.

IV. Results and Findings

A. 1898: End of Spanish Colonial Rule and the Transition into the American Occupation

The Spanish Walled City of Intramuros (literally, within the walls), was designed to defend against competing regional mercantilist powers such as the Portuguese, Dutch and the British; and to keep Chinese pirates and subversives out (Doepfers, 1972, p. 769-792; Murphy and Hogan, 2012, p. 7-9). It was planned following King Phillip II's Laws of the Indies (Doepfers, 1972, p. 769-792), creating a grid of narrow streets with a hierarchy of plazas that anchored church and government buildings. This was a socio-spatial reproduction of the European town and socio-spatial correspondence wherein colonial administrators, military officers, and laity kept within a contained urban footprint.

Outside Intramuros (Extramuros), the Sangleys (Chinese traders), flourished as trade with the Spanish grew (Kueh, 2013 and 2014). The Spaniards moved the Sangleys (due to

fears of revolt, risk of fire and disease) to what was to be successively relocated parian (or missionary) districts, until finally settling on the site of Binondo (the world's oldest established Chinatown) in 1594 (Armengol, 1958, p. 127; See Fig. 7 p. 20)

Similar settlements were formed as Intramuros' arrabales (suburbs) and became mission areas for church-building. These effectively placed most of the populace under bajo de la campana or "voice" of the bells. This policy was known throughout the Spanish Empire as Reduccion, and it was imposed throughout the archipelago as well. These formed a network of missions to replicate the parochial society of Christian Europe through the synchrony of church bells and rites throughout the liturgical calendar (Doepfers, 1972, p. 774-779).

These missions were administered through the farm-labor rights system called the encomienda, wherein missionary friar orders, grantee colonists, local sangleys, or mestizo (Spanish-Filipino) elite were assigned or let-out farmland for labor and production by the populace of each church (Doepfers, 1972, p. 772; Murphy and Hogan, 2012, p. 10). This effectively privatized control of land (Murphy and Hogan, 2012, p. 7-9). This was implemented outside Manila in what was later to become the Tuason Hacienda to the north-east, the Ortigas Hacienda to the east (Pante, 2017), and the Zobel de Ayala Hacienda in Makati to the southeast (Garrido, 2013; see Fig. 8, p. 20).

The spatial graph produced from the 1898 map of Manila and its suburbs presents three centuries of reducciones policy during the Span-ish period. Outside of Intramuros, local pedestrian centers emerge. These are the church mission areas that have higher average local integration (warm / red gradients) when compared to Intramuros' churches (see Fig. 9, p. 21, and Table 1, p. 22).

The abovementioned tabulation and analysis provide evidence to support the narrative, that the Mission Churches were indeed founded by the Spanish to evangelize the local populations located outside of Intramuros. Their higher local integration values indicate how each church is located specifically to maintain a local catchment population within the 'Bajo de la Campana.'

One can see how the warm-colored segments (See Fig. 9, p. 21) create a local isolated pedestrian integration core within Intramuros itself. But connectivity and integration of Intramuros spatial network naturally drop-off and does not connect well to the exterior spatial network outside of Intramuros.

Manila: City Beautiful Lost?

A Historical and Configurational Analysis of Daniel Burnham's Proposed 1905 City Beautiful Plan Poco

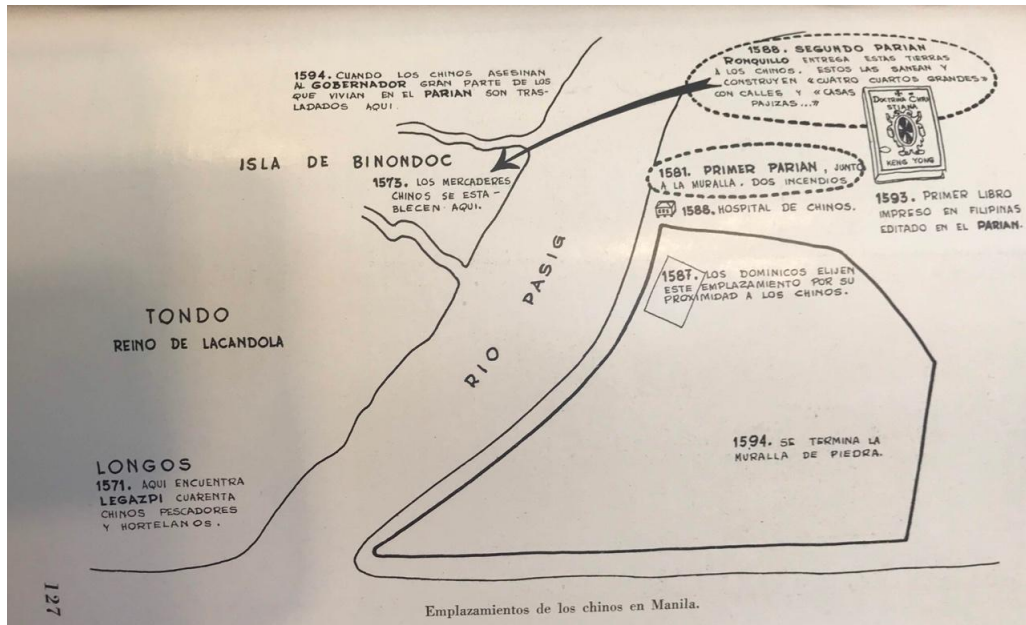


Figure 7. Chronological locations of Manila's Chinatown until 1594. Relocations done by the Spanish for security/health concerns

Source: Armengol, P.O. (1958). *Intramuros de Manila: de 1571 hasta su destruccion en 1945*. Ediciones de cultura hispanica, p. 127.

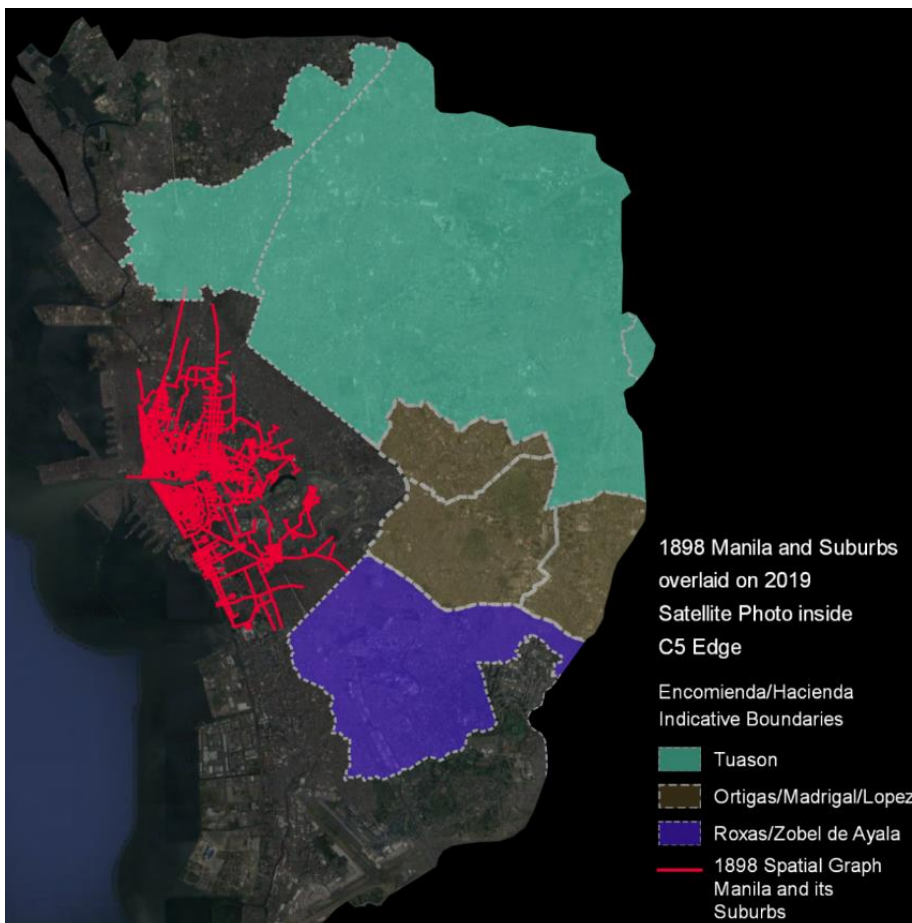


Figure 8 (left). 1898 Manila and Suburbs – overlaid on 2019 Satellite Photo inside C5 Edge. Showing indicative Encomienda/Hacienda Boundaries based on present-day government unit boundaries.

Drawn by author using QGIS overlaid on: *Plano de Manila y sus Arrabales 1898*, sourced from Perry Castaneda Library Map Collection, (Accessed 20 February 2019), , HYPERLINK "<https://legacy.lib.utexas.edu/maps/p hilippines.html>", and overlaid on Google Earth Satellite Photo.

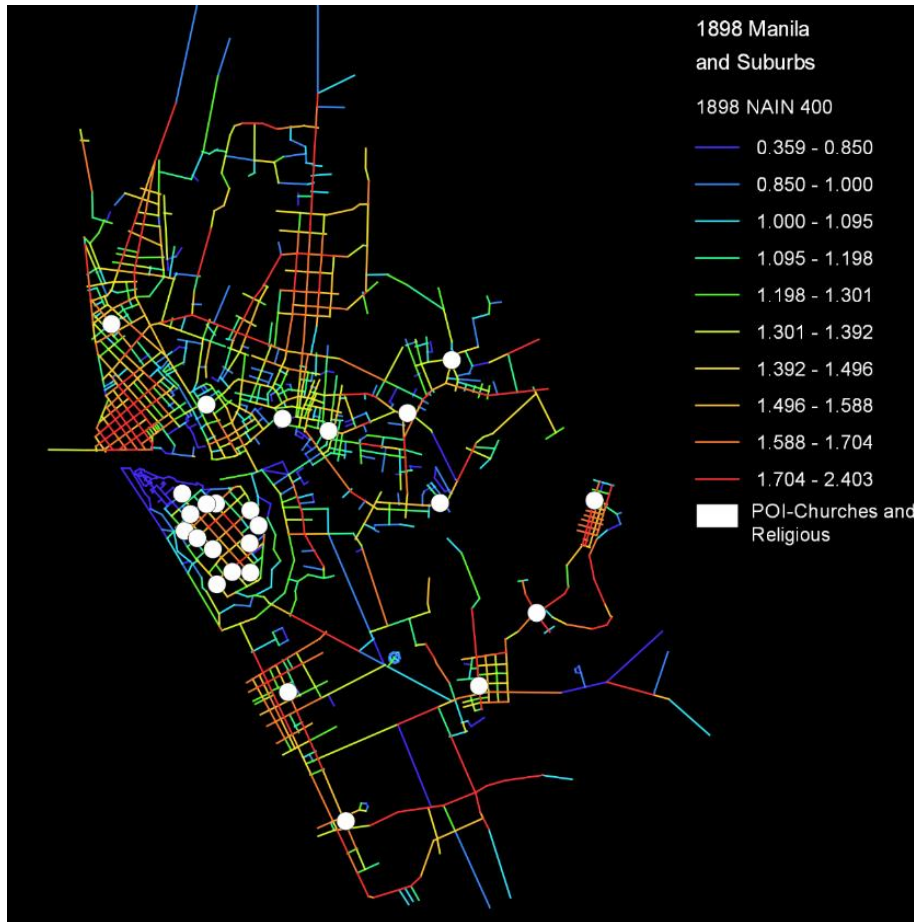


Figure 9 (left). 1898 Manila, NAIN radius 400 – showing 1898 Spanish Manila's Churches / Religious Points of Interests, with Mission Churches located on locally/pedestrian-integrated segments of the 1898 Network. (See Table 1 page 7 for Church / Religious Points-of-Interest and corresponding integration values)

Analyzed using Depthmap X by UCL depthmap X development team (2018), Drawn by author using QGIS overlaid on: Plano de Manila y sus Arrabales 1898, sourced from Perry Castaneda Library Map Collection, (Accessed 20 February 2019), , HYPERLINK "<https://legacy.lib.utexas.edu/maps/philippines.html>" "<https://legacy.lib.utexas.edu/maps/philippines.html>"

To the Spanish colonists, Intramuros was the center of the network around it; outside, they placed defensive positions to guard against the populace. But their imposed order focusing on the walled city, was subsumed by the spatial structure of the suburbs around it. This is expounded on as we change the radius of analysis from pedestrian movement range to global movement range.

Using global Integration analysis, Binondo (in warm/red gradient), ironically emerges as the crossroads of the 1898 spatial network (See Fig. 10, p. 23), as it takes advantage of being across the Puente Espana/Bridge from Intramuros, becoming the primary route connecting both north and south banks of the Pasig River.

The Sangley Chinese-Filipino traders who were once marginalized and excluded by the Spanish colonists end up occupying the most opportunistically located integration centrality that was to become Manila's Chinatown/Trading District.

The above graph's cool gradient of values in Intramuros (See Fig. 10, p. 23) presents the relative local isolation and spatial segregation of Intramuros, a natural consequence of its being a walled enclave for the Spanish colonial administration. One could say that – to the colonist's eyes, Binondo was the first suburban edge city (Garreau, 1992) – a place of commerce and trade outside Intramuros, which it was for most of Metro Manila's historical development, until the rise of its CBDs outside of Manila.

Manila: City Beautiful Lost?

A Historical and Configurational Analysis of Daniel Burnham's Proposed 1905 City Beautiful Plan
Poco

Table 1. 1898 Manila, NAIN radius 400 – 1898 Spanish Manila's Churches / Religious Points of Interest, With Mission Churches located on locally/pedestrian-integrated segments of the 1898 Network, having consistently higher values over classified / system averages. See Fig. 9, page 21, for Church / Religious Points-of-Interest overlaid on Graph and Legend

Analyzed using Depthmap X by UCL depthmap X development team (2018)

id	1898 POIs	Type	IntraExtra	NAIN_0400
26	San Juan De Dios	Religious	Intramuros	1.34042
29	San Francisco	Religious	Intramuros	0.9787
28	Orden Tercera	Religious	Intramuros	1.27419
20	Sto Domingo	Religious	Intramuros	1.53103
21	Beato de Sta Rosa	Religious	Intramuros	1.12637
19	Monjas de Sta Clara	Religious	Intramuros	0.95903
9	Palacio Arzobispal	Religious	Intramuros	1.36901
22	Catedral	Religious	Intramuros	0.94637
25	Sta Isabel	Religious	Intramuros	1.20604
27	San Agustin	Religious	Intramuros	1.46049
30	Recoletos	Religious	Intramuros	1.32122
31	San Ignacio	Religious	Intramuros	1.59183
32	Beato dela Compania	Religious	Intramuros	1.45652
51	Iglesia de Paco	Religious	Extramuros	1.728
52	Iglesia Malate	Religious	Extramuros	1.42863
53	Iglesia Ermita	Religious	Extramuros	1.67066
57	Iglesia Pandacan	Religious	Extramuros	1.57252
58	Iglesia Penafancia	Religious	Extramuros	1.82628
68	Iglesia Sta. Cruz	Religious	Extramuros	1.03888
69	Iglesia Ongpin Binondo	Religious	Extramuros	1.15038
73	Iglesia Tondo	Religious	Extramuros	1.40591
75	Iglesia Sampaloc	Religious	Extramuros	1.32684
77	Iglesia San Miguel	Religious	Extramuros	1.41099
79	Iglesia San Sebastian	Religious	Extramuros	1.23211
102	Iglesia Quiapo	Religious	Extramuros	1.33779
Average	System Ave	Average		1.267238025
Average	Intramuros	Average	Intramuros	1.217285
Average	Extramuros	Average	Extramuros	1.307200444
Average	Religious	Average		1.3476084
Average	Rel. Intra	Average	Intramuros	1.27394
Average	Rel. Extra	Average	Extramuros	1.427415833



Figure 10. 1898 Manila, NAIN radius N – showing 1898 Spanish Manila’s Spatial Integration Core found in the Binondo / Chinatown Trading District.

Analyzed using Depthmap X by UCL depthmap X development team (2018), Drawn by author using QGIS overlaid on: Plano de Manila y sus Arrabales 1898. sourced from Perrv Castaneda Librarv Map Collection. (Accessed 20 Februarv 2019). [HYPERLINK](#)

Manila: City Beautiful Lost?

A Historical and Configurational Analysis of Daniel Burnham's Proposed 1905 City Beautiful Plan
Poco

B. Benevolent Assimilation: Burnham's City Beautiful Plan as blueprint for fragmentation

After the Spanish-American war ended in 1898, America consolidated its hold on its new Philippine territory through President McKinley's proclamation of "benevolent assimilation", which sought to bring social, civic and practical reforms – like sanitation and infrastructure to the "backward" Philippines (Miller, 1982). Ocampo (1992) discusses how Daniel H. Burnham, and his associate, Pierce Anderson were invited to the Philippines in 1905 by the new colonial administration, to prepare the Masterplan for Manila.

Their intent was to unify Intramuros and its disparate local arrabales districts into the colony's new capital with a government center in a new civic core. They sought to preserve the city's heritage in Intramuros and prepare for Manila's rapid population growth and dispersal with the development of industry, agriculture, and transportation.

Burnham's proposed plan sets out to "assimilate" the different reducciones mission areas (signified by the original 1898 mission churches) with a city-wide radial concentric grid of streets and bridge crossings that join the north and south banks of the Pasig River. This was to connect the disparate mission areas as part of a broader urban framework that combines Intramuros and its suburbs into what could be considered the modern city of Manila (See Fig. 11, below).

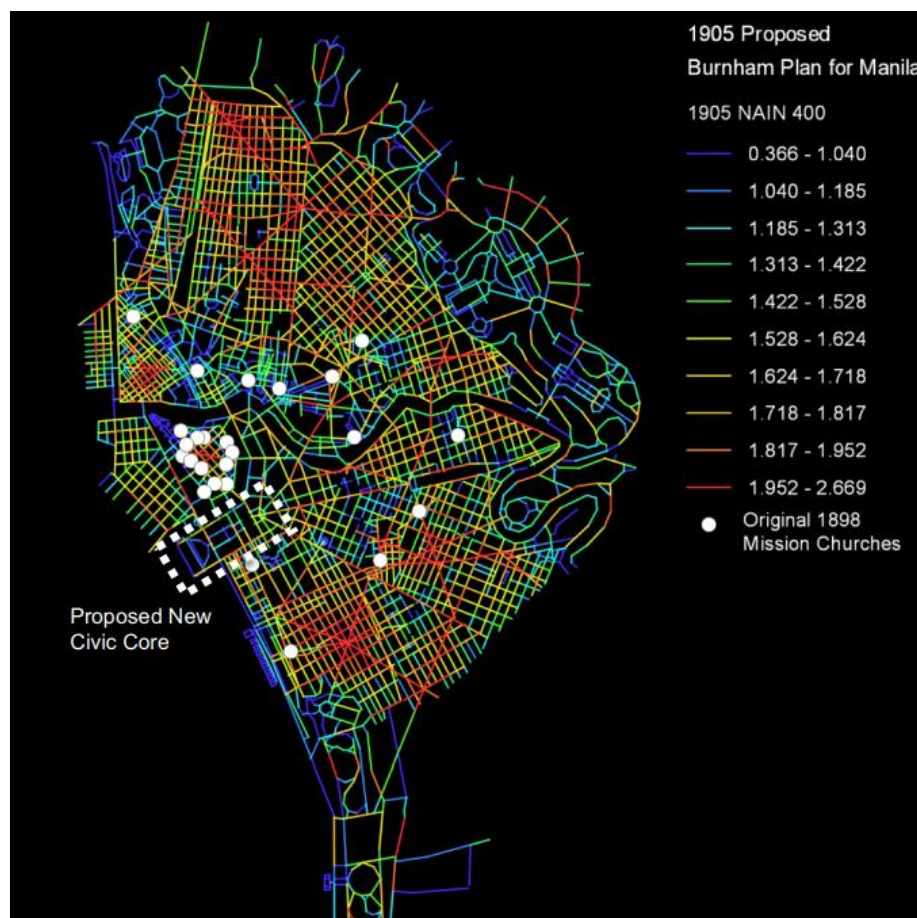


Figure 11 (left). 1905 Proposed Burnham Plan for Manila, NAIN radius 400 – showing 1898 Spanish Manila's original mission churches, integrated into Burnham's proposed broader spatial network

Analyzed using Depthmap X by UCL depthmap X development team (2018), Drawn by author using QGIS overlaid on: Plans for the Development of Manila, Submitted to the Philippine Commission by D.H. Burnham, 1905. sourced from Burnham, D.H. (1905), Report on Improvement of Manila (Accessed 5 February 2019), HYPERLINK "<http://fac.arch.hku.hk/asian-cities-research/wp-content/uploads/Manila-Plan.jpg>" <http://fac.arch.hku.hk/asian-cities-research/wp-content/uploads/Manila-Plan.jpg>

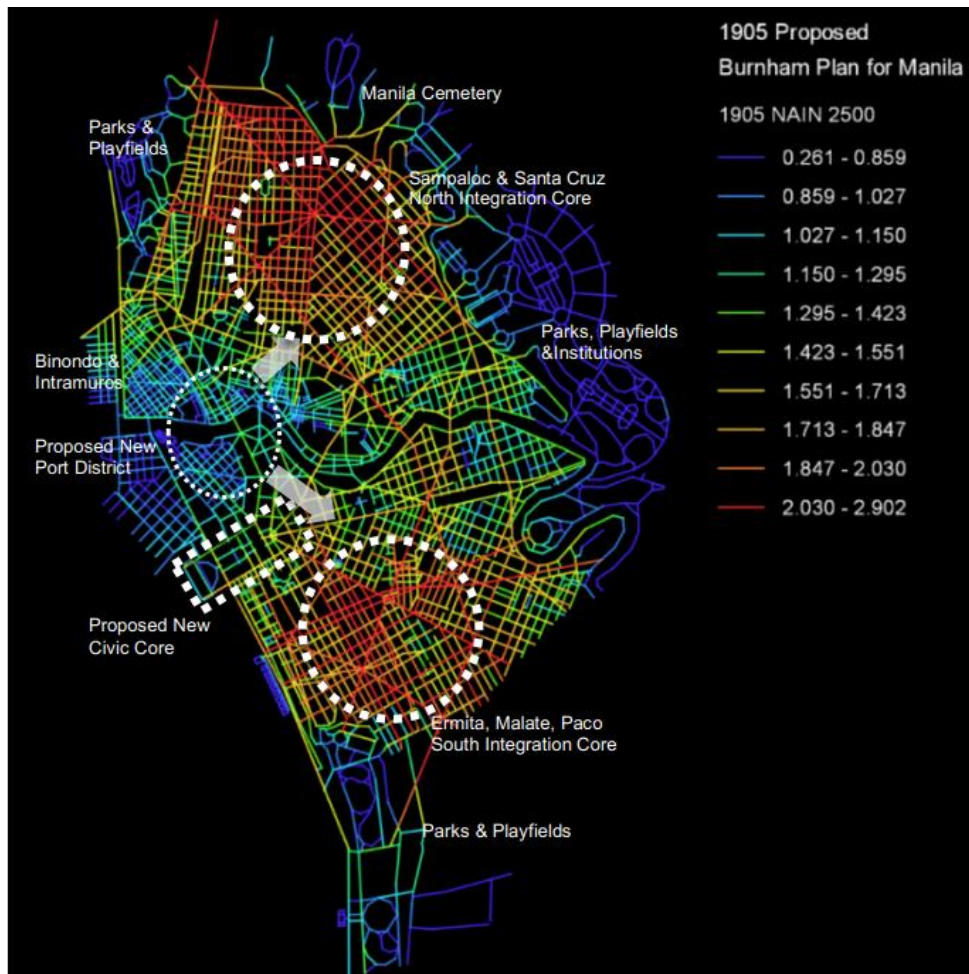


Figure 12. 1905 Proposed Burnham Plan for Manila, NAIN radius 2500 – showing shift of integration core away from Binondo toward 2 fragmented integration areas north and south of the Pasig River.

Analyzed using Depthmap X by UCL depthmap X development team (2018), Drawn by author using QGIS overlaid on: Plans for the Development of Manila, Submitted to the Philippine Commission by D.H. Burnham, 1905. sourced from Burnham, D.H. (1905), Report on Improvement of Manila (Accessed 5 February 2019), [HYPERLINK "http://fac.arch.hku.hk/asian-cities-research/wp-content/uploads/Manila-Plan.jpg"](http://fac.arch.hku.hk/asian-cities-research/wp-content/uploads/Manila-Plan.jpg) <http://fac.arch.hku.hk/asian-cities-research/wp-content/uploads/Manila-Plan.jpg>

This proposed street network was to radiate from what was to be Burnham's suggested site for the Government Centre / National Mall, planned on the crescent-shaped open defensive buffer beside Spanish Intramuros. The key feature of the mall was an axis left empty as a civic venue for political campaigns, inaugurations, and rallies, effectively reproducing the spatial practice of Washington DC's National Mall, from which Burnham drew inspiration (Scott, 1969; Ocampo, 1992; Morley, 2014, p. 7-8).

Replicating Oramas-Dorta's (2012) findings for other planned capitals, Burnham's National Mall does not create a unifying civic core of activity, and instead shifts the integration core of the city into 2 separate areas to the north and south of Pasig River (See Fig. 12, above).

While Burnham pre-dated the concept of a modern central business district, Shepard (1937) notes that, "He sought to preserve Binondo's position as the business center by extending wharfage north of the Pasig and improving warehouse, harbor, and other port facilities." As shown in Fig. 12 (above), Burnham fails in doing so as Binondo's integration levels drop (blue/cool gradient), when compared to the new Integration cores north and south of the Pasig River (in red/warm gradient). These are analyzed further using a comparison of mean spatial values (See Figs. 13-14 and Table 2, p. 26) between the 1905 Historic Core, the 1905 North Integration Core, and the 1905 South

Integration Core. One can see that the Historic Core has lower values compared to the new integration cores, with the Southern Core in blue having the highest mean integration values.

The transfer of power from the Philippines to the United States saw the first deliberate effort to undertake land reform and undermine the system of the encomiendas/hacienda estates. The US initiated the purchase of these lands, for partitioning and redistribution into smaller cuts for Filipinos to own, but the policy saw most of the encomiendas sold to the original rights grantees, thereby formalizing their hold on the estates (Seekins, 1993; Iyer, 2009, p. 10-12).

On Manila's edges, Burnham proposes to locate various open spaces as parks and playfields for recreation. While one can point to similar green belts around British cities, Burnham's open spaces were adjoining and overlapping the private hacienda estates outside of Manila's city limits – and its administrative control. Burnham's successors are left largely inutile to the interests of the landowners of these private estates (See Fig. 15, p. 27).

Manila: City Beautiful Lost?

A Historical and Configurational Analysis of Daniel Burnham's Proposed 1905 City Beautiful Plan Poco

Table 2. Proposed 1905 NAIN Values for the old core versus the actual new integration cores.

Analyzed using Depthmap X by UCL depth map X development team (2018)

Districts	NAIN_R400m	NAIN_R600m	NAIN_R800m	NAIN_R1000	NAIN_R1200	NAIN_R1500	NAIN_R2000	NAIN_R2500	NAIN_R3000	NAIN_R4000	NAIN_R5000	NAIN_Rn
Historic Civic Core	1.50356	1.48213	1.46325	1.44830	1.44128	1.43542	1.43615	1.43093	1.42313	1.39758	1.37327	1.40139
1905 North Integration Core (Santa Cruz, Tondo, Sampaloc)	1.50626	1.48640	1.47137	1.46052	1.45654	1.45327	1.45650	1.45151	1.44152	1.41170	1.38412	1.40971
1905 South Integration Core (Paco, Malate and Santa Ana)	1.52057	1.50407	1.49061	1.47970	1.47589	1.47439	1.48661	1.48397	1.47372	1.43657	1.40201	1.43338

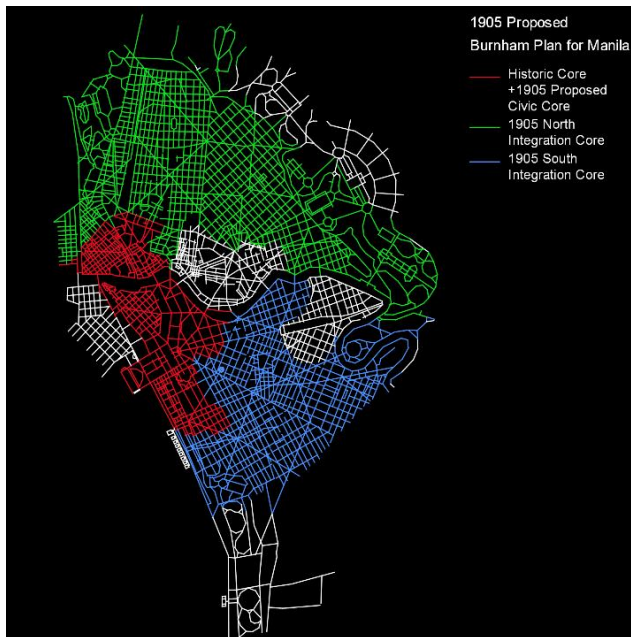


Figure 13. Chart Legend: Proposed 1905 Burnham Plan for Manila, highlighting the old core of Binondo, Intramuros, San Nicolas, and Burnham's Proposed National Mall in Ermita, versus the actual new integration cores formed by the plan (in green and blue)

Drawn by author using QGIS overlaid on: *Plans for the Development of Manila, Submitted to the Philippine Commission by D.H. Burnham, 1905.* sourced from Burnham, D.H. (1905), *Report on Improvement of Manila* (Accessed 5 February 2019), [HYPERLINK "http://fac.arch.hku.hk/asian-cities-research/wp-content/uploads/Manila-Plan.jpg"](http://fac.arch.hku.hk/asian-cities-research/wp-content/uploads/Manila-Plan.jpg)
<http://fac.arch.hku.hk/asian-cities-research/wp-content/uploads/Manila-Plan.jpg>

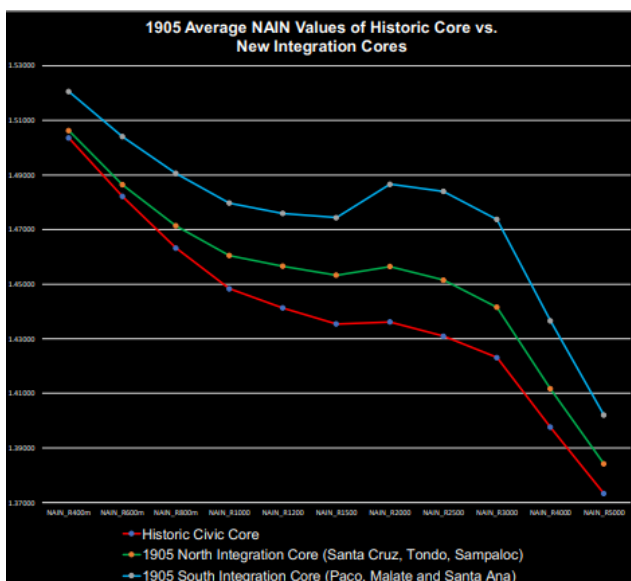


Figure 14. Chart Comparison: Proposed 1905 NAIN Values for the old core versus the actual new integration cores.

Analyzed using Depth map X by UCL depth map X development team (2018)

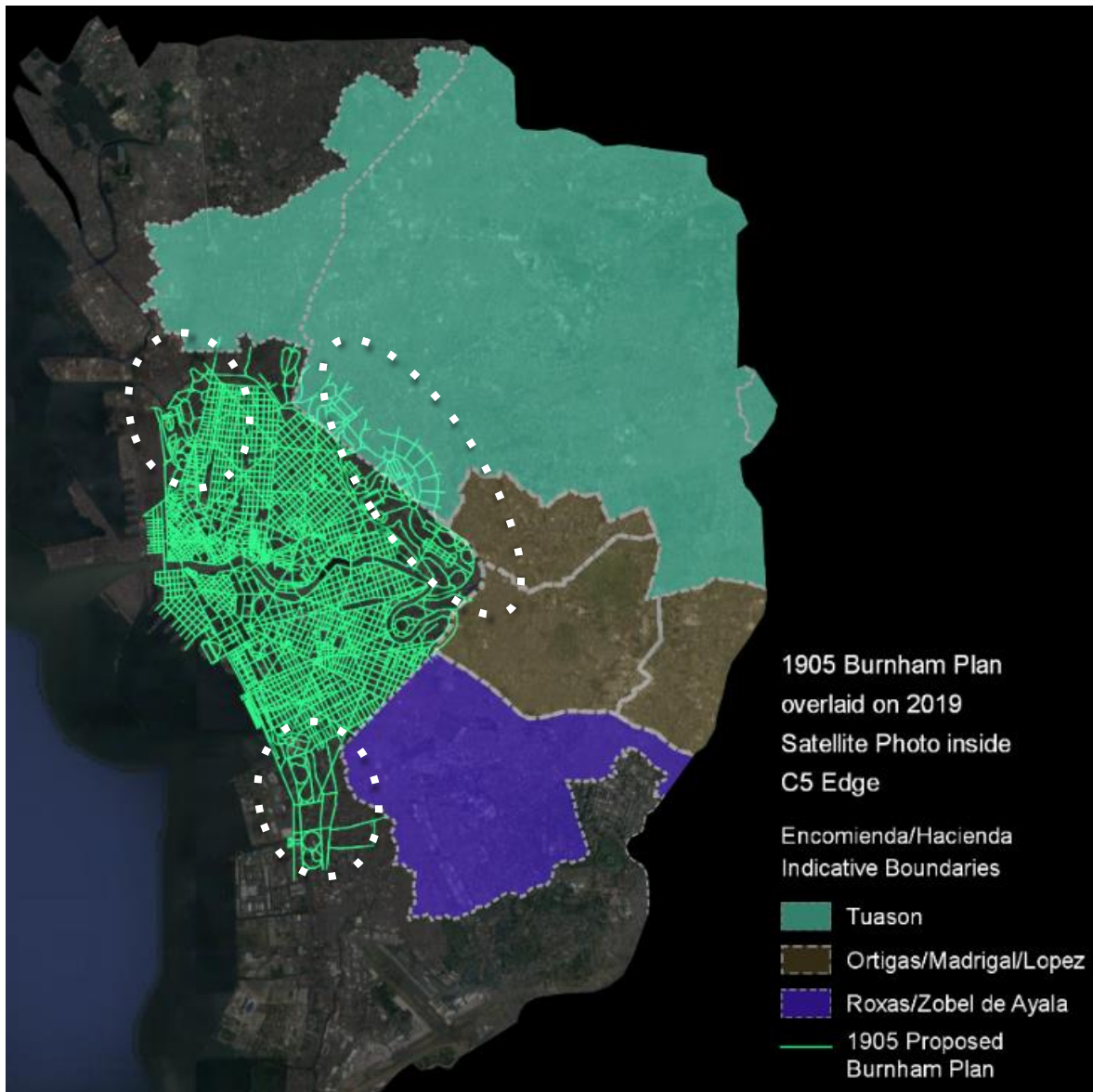


Figure 15. Proposed 1905 Burnham Plan – overlaid on 2019 Satellite Photo inside C5 edge. Showing the Burnham Plan’s parks and playfields, and indicative Encomienda/Hacienda boundaries based on present-day government unit boundaries.

Drawn by author using QGIS overlaid on: Plans for the Development of Manila, Submitted to the Philippine Commission by D.H. Burnham, 1905. sourced from Burnham, D.H. (1905), Report on Improvement of Manila (Accessed 5 February 2019), HYPERLINK "<http://fac.arch.hku.hk/asian-cities-research/wp-content/uploads/Manila-Plan.jpg>" <http://fac.arch.hku.hk/asian-cities-research/wp-content/uploads/Manila-Plan.jpg>, overlaid on Google Earth Satellite Photo.

C. 1945 Manila: Fragmentation and the Bayfront Enclave

William E. Parsons was appointed as Consulting Architect to the Insular Government in November 1905 (Ocampo, 1992). He was tasked to oversee and implement the Burnham plan. He defined the arterial framework for construction, along with the plots for the various civic buildings. Then to meet demand for industrial land for production, re-zoned the southern banks of the Pasig River from residential into industrial uses (Arellano, 1919 and Mapua, 1920). Parsons and his successors oversaw the growth of Manila, until the Japanese invasion of World War 2, and Manila’s eventual destruction in 1945, as it became a

battleground for liberation forces as they cleared the Japanese from the city through block-by-block shelling and street fighting.

The non-completion of Burnham’s planned riverside road networks and interconnecting north-south bridges, along with Parson’s rezoning of the Pasig riverbanks into large Industrial parcels (see Fig. 16, p. 28), signal the fragmentation of the 1945 Spatial Network into two separate north and south cores.

This fragmentation appears at the angular integration measure (NAIN) of 2500m (See Fig. 17, p. 29). This shows how the Burnham Plan could have initiated the hollowing-out of Manila’s downtown and the migration of centralities

Manila: City Beautiful Lost?

A Historical and Configurational Analysis of Daniel Burnham's Proposed 1905 City Beautiful Plan Poco

out to the city's new suburbs (warm/red gradients in Fig. 17, p. 29). Focusing on the angular integration (NAIN) values of the north and south cores of Manila, one can see that the Historic Core has lower average angular integration (NAIN) values than the new north and south Integration Cores.

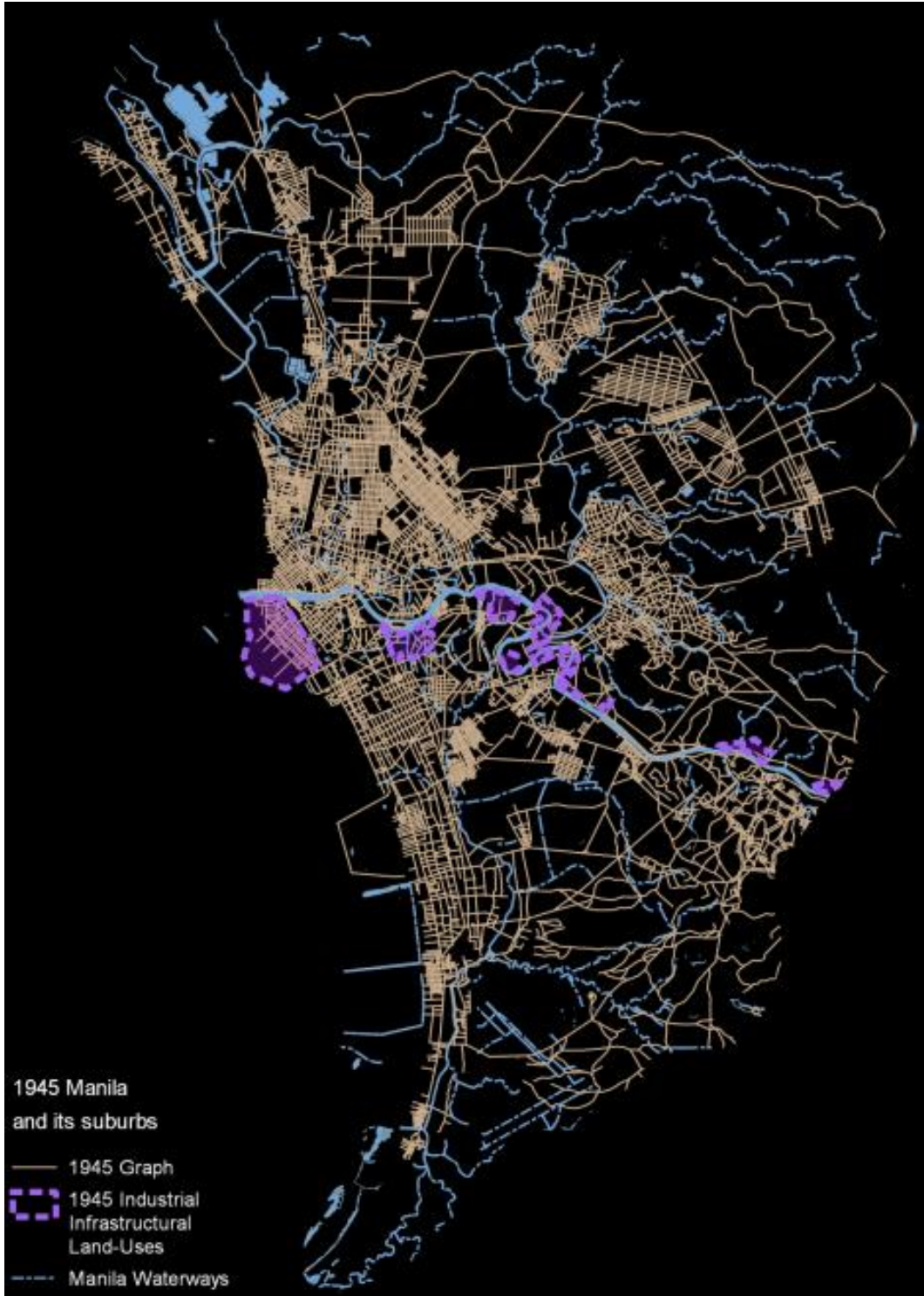


Figure 16. 1945 Spatial Network Graph of Manila – showing Industrial & Infrastructural Land Uses along the Pasig River.

Drawn by author using QGIS overlaid on: Manila 1945 artillery and ordnance maps of US Army Air Force: sourced from Perry Castaneda Library Map Collection, (Accessed 20 February 2019), <https://legacy.lib.utexas.edu/maps/philippines.html>

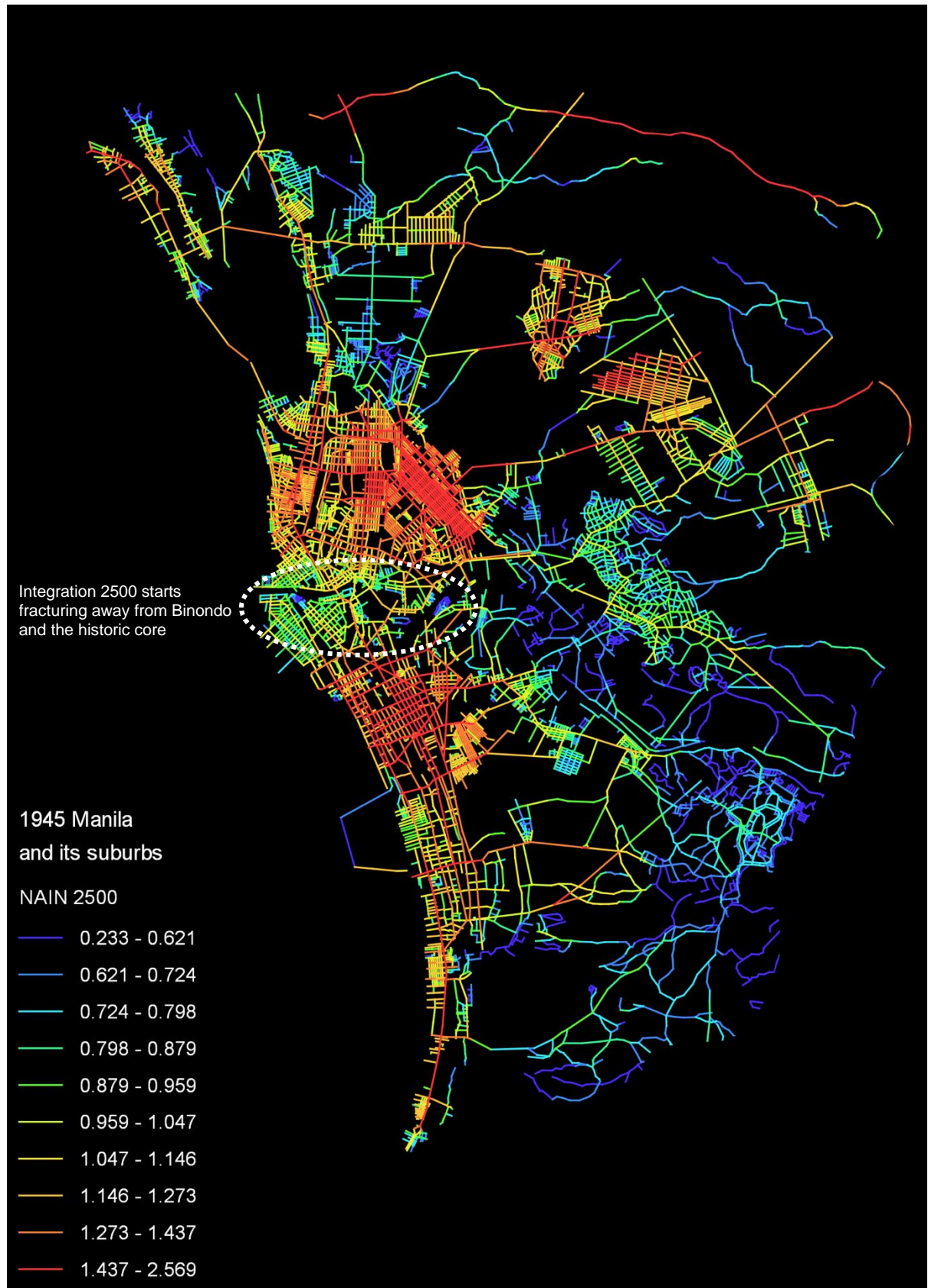


Figure 17. 1945 Spatial Network Graph of Manila, NAIN 2500 - showing 1945 Manila's integration core beginning to fragment into separate halves.

Analyzed using Depth map X by UCL depth map X development team (2018), Drawn by author using QGIS overlaid on: Manila 1945 artillery and ordnance maps of US Army Air Force: sourced from Perry Castaneda Library Map Collection, (Accessed 20 February 2019), <https://legacy.lib.utexas.edu/maps/philippines.html>

Manila: City Beautiful Lost?

A Historical and Configurational Analysis of Daniel Burnham's Proposed 1905 City Beautiful Plan Poco

This north-south fragmentation gives rise to a different kind of enclave. The southern integration core fronting Manila Bay (then known as the premiere address during the American colonial period) forms and corresponds with American colonial settlements and institutions (See Fig. 18 below, Fig. 19-20, p. 31).

This southern integration core hosts a concentration of American-founded institutions (in yellow) and is itself buffered from the rest of the urban fabric by Burnham's National Mall to the north, the Estero de Paco to the East, and Burnham's Park No. 1 or Harrison Park to the south (See Fig. 19, p. 31).

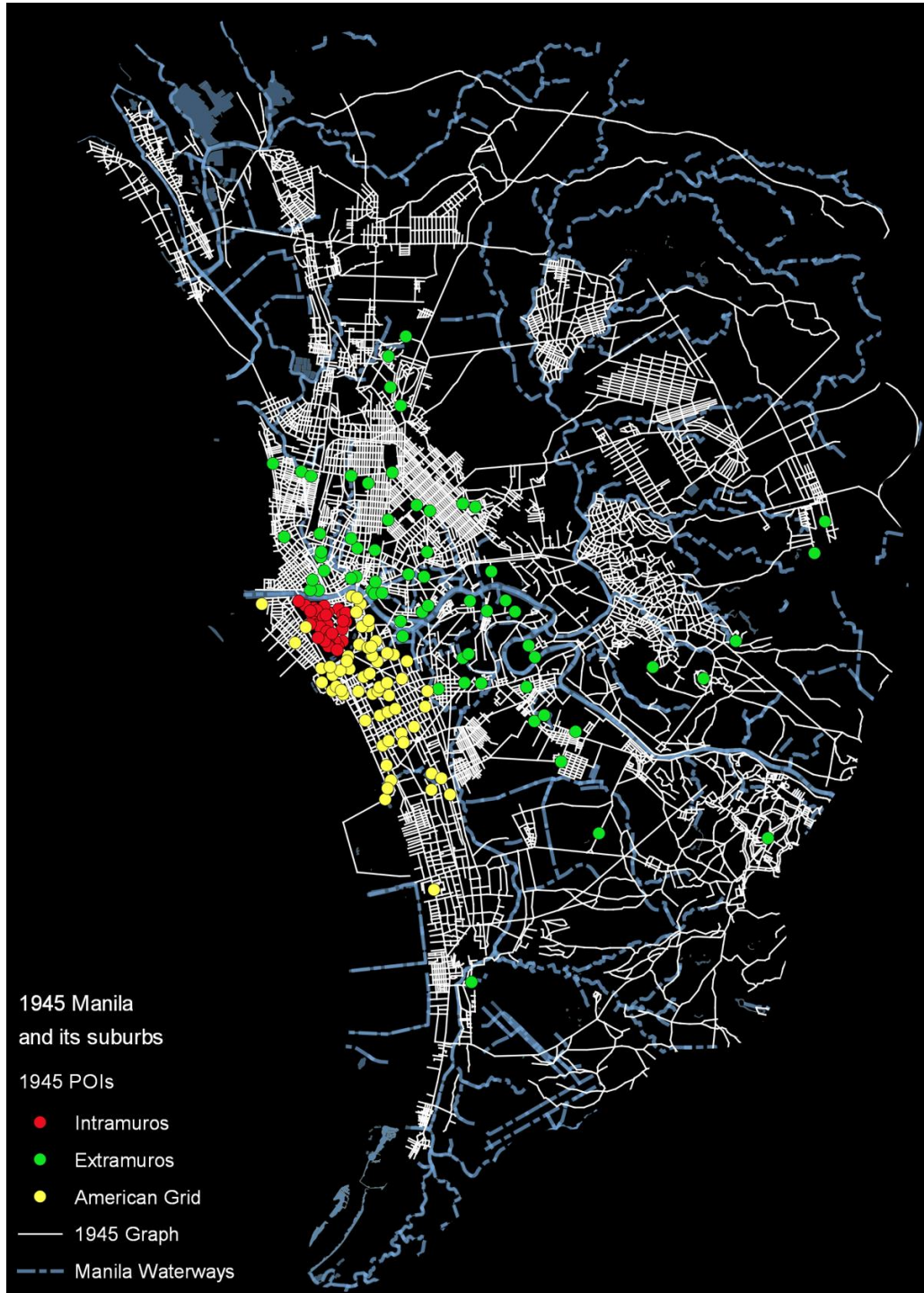


Figure 18. Chart Legend: 1945 Spatial Network Graph of Manila - showing clustering of American Points-of-Interest around the American Bayfront area (Ermita and Malate) compared to Intramuros and Extramuros Points-of-Interest. To be read with Fig. 19 and 20, p. 31.

Analyzed using Depth map X by UCL depth map X development team (2018), Drawn by author using QGIS overlaid on: Manila 1945 artillery and ordnance maps of US Army Air Force: sourced from Perry Castaneda Library Map Collection, (Accessed 20 February 2019), <https://legacy.lib.utexas.edu/maps/philippines.html>

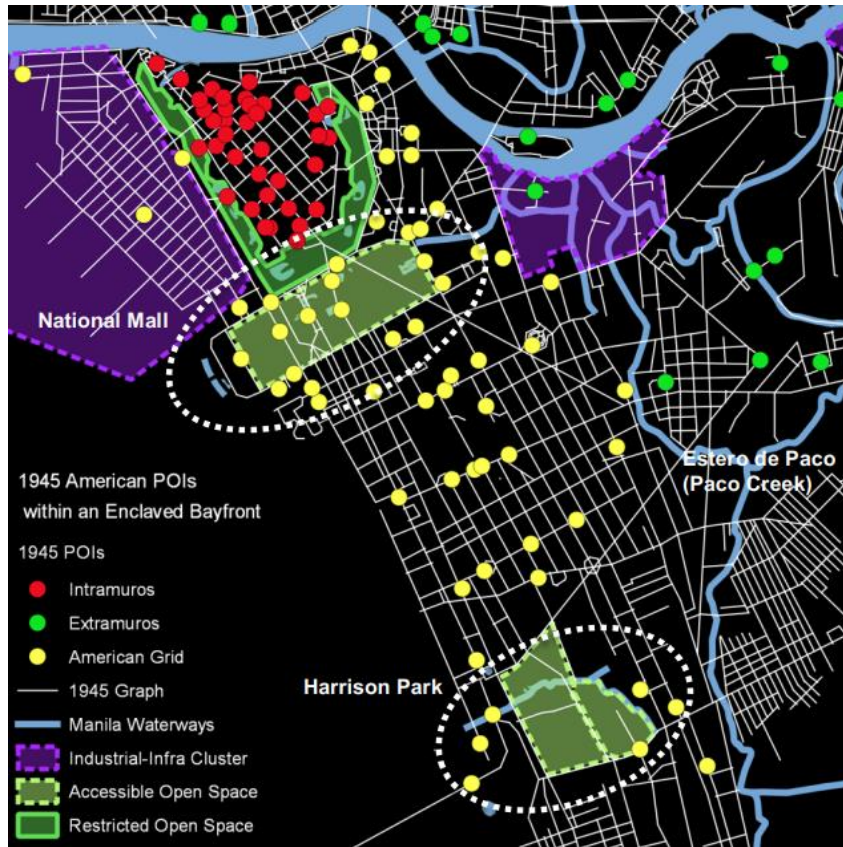


Figure 19. Chart Legend: 1945 Spatial Network Graph of Manila - showing clustering of American Points-of-Interest around the American Bayfront area (Ermita and Malate), and the land-use / natural buffers surrounding the Bayfront District. To be read with Fig. 18, p. 30 and Fig. 20, below.

Analyzed using Depth map X by UCL depth map X development team (2018), Drawn by author using QGIS overlaid on: Manila 1945 artillery and ordnance maps of US Army Air Force: sourced from Perry Castaneda Library Map Collection, (Accessed 20 February 2019), <https://legacy.lib.utexas.edu/maps/philippines.html>

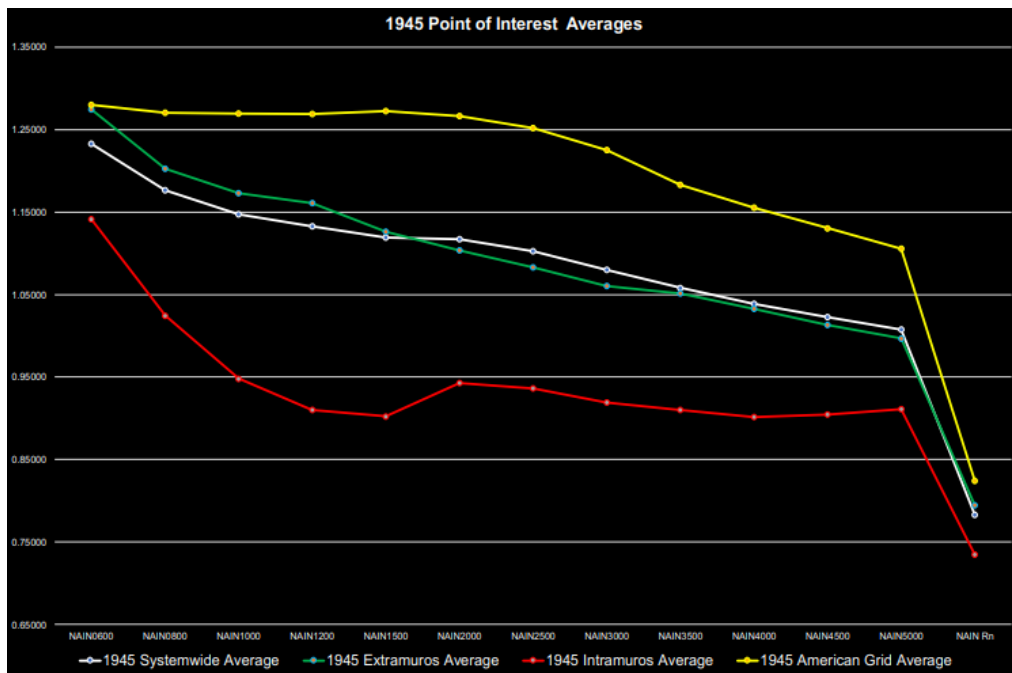


Figure 20. Graph Comparison: 1945 Spatial Network Graph of Manila – average NAIN Values for Points of Interest showing how American POIs (in yellow) have higher NAIN across the range, versus POIs in Intramuros and Extramuros, illustrating how American institutions have taken up prime, accessible positions on the Manila Bayfront. To be read with Fig. 18, p. 30 and Fig. 19, above. Analyzed using Depth map X by UCL depth map X development team (2018).

Manila: City Beautiful Lost?

A Historical and Configurational Analysis of Daniel Burnham's Proposed 1905 City Beautiful Plan Poco

The higher accessibility of the establishments located in the 'American Grid', coupled with these physical and spatial buffers is reminiscent to other similar internally accessible enclaves, e.g., Manhattan, or locally –today's Bonifacio Global City. This is evidence that the most prime address during that time, was a wall-less enclave, embodying American colonial power and society.

D. 1945: Suburbanization and Expansion

Burnham's open spaces to the east of Manila could no longer be enforced on the Tuason, Ortigas, and Zobel de Ayala Haciendas. The development of these haciendas as Manila's suburbs was spurred by Pres. Quezon's pre-war plan to transfer the capital of the Philippines to Quezon City, which was to be sited on land purchased from the vast north-east Tuason Hacienda (Pante, 2018, p. 15-38).

By 1945 the first street grid was laid down for what was to be Quezon City's South Triangle. Effectively, the hacienda edges closest to Manila –were developed as suburban expansions (See Fig. 21, below) of the core's population (Pante 2018, p. 15-38; Garrido 2013, p. 171-172).

Murphy and Hogan (2012, p.26) point out that past catastrophic events leading to the destruction of cities, such as the Great Fire of London (discussed by Hanson, 1989; and expounded on by Karimi, 2012) and the fires that devastated San Francisco and Chicago (both re-planned afterwards by Daniel Burnham) have been impetus for a flowering of civic spirit amongst wealthy private interests to rebuild and improve on their cities. Manila's elite, on the other hand, in an exercise of private interest, sought to move away from the devastated heart of Manila, and leave rebuilding it to the government.

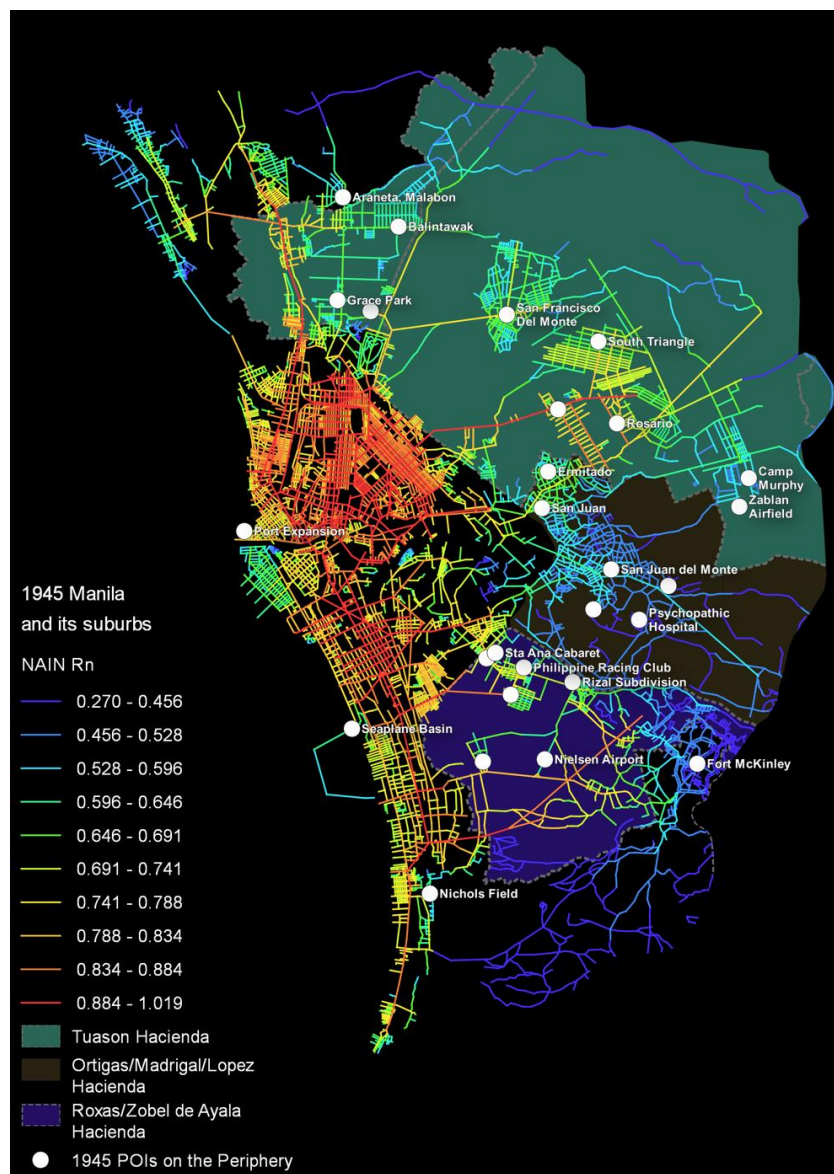


Figure 21. 1945 Spatial Network Graph of Manila, NAIN Rn with Points-of-Interest outside Manila (within the Haciendas)

Analyzed using Depth map X by UCL depth map X development team (2018), Drawn by author using QGIS overlaid on: Manila 1945 artillery and ordnance maps of US Army Air Force: sourced from Perry Castaneda Library Map Collection, (Accessed 20 February 2019), <https://legacy.lib.utexas.edu/maps/philippines.html>

V. Discussion

A. Responses to Research Questions

In response to the first question, the 1905 Burnham Plan sought to unify the disparate *reducciones* districts into an interconnected whole. In doing so, the Burnham Plan inadvertently shifts integration away from Binondo, which was Spanish Manila's Core. This served to ultimately bypass and emphasized *Intramuros'* disconnection from the spatial grid as an enclave.

In response to the second research question, the adapted and later-on abortive implementation of the 1905 Burnham Plan ended up bringing Manila's North-South fragmentation (unintentionally foreshadowed by the 1905 Plan) into fruition. Integration migrated north and south of Binondo. This creates a new wall-less enclave on the southern integration core, where Malate and Ermita became the prime American colonial address, Manila's bayfront district.

Manila's surrounding territories happily took on the task of becoming suburban catchment for the rapidly growing city. After World War 2, privately owned properties on Manila's edges became preferred locations for people looking to start anew. More than what the 1905 Burnham Plan was or was not able to do, this study highlights the limits of the Burnham Plan's geographical scope, outside of which, government had limited capacity to impose the same authority and control in planning and regulating growth outside Manila's city limits.

B. Limitations

All spatial accessibility analysis is undertaken using a combination of QGIS and Depthmap X software (depthmap X development team, 2018), with statistical analysis using IBM SPSS software. Majority of this study was undertaken offsite in the United Kingdom (based in London), for a period of approximately five months. It relies on available historical maps from archival sources online and from the British Library; and remotely collected data sourced from: Open Street Map, Google Earth, and the Philippine Geportal for checking against the present-day spatial network.

Spatial syntax are probabilistic methods based on applying graph centralities to analyze the spatial configuration of cities. As this is a historical assessment of spatial configuration, this study does not weigh these graphs for historical land use, density, road right-of-way width, and actual vehicular or foot traffic counts. This study instead uses parallel data as proxies for historical socio-economic behavior and human interaction (Enclave Boundaries, Historic Points-of-Interest from historical maps and ethnographic narratives) to form a broader methodology. It is by comparing these data with configurational values using descriptive statistics that this study shows how Manila's embedded spatial properties correspond with its underlying historical and socio-economic historical narratives.

C. Conclusions, Reflections, and Recommendations

Because it was an unimplemented proposal, the Burnham Plan kindled a symbolic significance as the lost City Beautiful that Manila was supposed to be. But its dimensions were ultimately bounded by its brief within Manila's city limits. Ultimately, this points to how Metro Manila's present-day disfunctions are not just a planning/design problem, but one of socio-political control over the privatized land holdings that sprung from these *haciendas/encomienda* estates.

This study highlights how Metro Manila's spatial configuration unfolds across time and spatial scales with repeating patterns of centrality and exclusion. This study shows that Metro Manila's historical events and social histories interact reflexively with its patterns of spatial configuration. This provides evidence that Manila has an underlying socio-spatial logic, produced by both the deliberate top-down efforts of authorities and planners, and concurrent unintended consequences brought about by this imposition of order on the city. There is much work to be done to propel discourse forward, and space syntax is just one of the many tools to bring a more quantitative dimension to research.

Manila: City Beautiful Lost?

A Historical and Configurational Analysis of Daniel Burnham's Proposed 1905 City Beautiful Plan

Poco

References

- Alcazaren, P. (2003, June 28). *A city beautiful*. The Philippine Star. <https://www.philstar.com/lifestyle/modern-living/2003/06/28/211724/city-beautiful>
- Alcazaren, P. (2003, July 5). *Building a city beautiful*. The Philippine Star. <https://www.philstar.com/lifestyle/modern-living/2003/07/05/212584/building-city-beautiful>
- Armengol, P.O. (1958). *Intramuros de Manila: de 1571 hasta su destrucción en 1945*. Ediciones de cultura hispánica.
- Charalambous, N., & Mavridou, M. (2012). Space syntax: Spatial integration accessibility and angular segment analysis by metric distance (ASAMeD). In A. Hull, C. Silva, & L. Bertolini (Eds.), *Accessibility instruments for planning practice* (pp.57-62). Porto: COST Office.
- Dalton, N. (2001). Fractional configurational analysis and a solution to the Manhattan problem. In J. Peponis, J. Wineman, & S. Bafna (Eds.), *Proceedings space syntax* (pp. 26.1-26.13). 3rd International Symposium, Atlanta.
- Depthmap X development team, UCL. (2017). depthmap X 0.6. [Software].
- Doeppers, D. F. (1972). The development of Philippine cities before 1900. *The Journal of Asian Studies*, 31(4), 769-792.
- Duque, E. (2009). Militarization of the city: Implementing Burnham's 1905 plan of Manila. *Fabrications*, 19(1), 48-67.
- Flores, M. (2018, July 23). *Duterte vows to decentralize to bring wealth to regions*. Nikkei Asia.com. [https://asia.nikkei.com/Politics/Duterte-vows-to-decentralize-to-bring-wealth-to-regions]
- Garreau, J. (1992). *Edge city: Life on the new frontier*. Knopf Doubleday Publishing Group.
- Garrido, M. (2013). The ideology of the dual city: The modernist ethic in the corporate development of Makati City, Metro Manila. *International Journal of Urban and Regional Research*, 37(1), 165-185.
- Gonzaga, F. (2014). *Monsoon marketplace: Inscriptions and trajectories of consumer capitalism and urban modernity in Singapore and Manila* [Doctoral dissertation, UC Berkeley].
- Hanson, J. (1989). Order and structure in urban design: the plans for the rebuilding of London after the Great Fire of 1666. *Ekistics*, 56, 22-42.
- Hillier, B., & Hanson, J. (1984). *The social logic of space*. Cambridge University Press.
- Hillier, B., Penn, A., Hanson, J., Grajewski, T., & Xu, J. (1993). Natural movement: or, configuration and attraction in urban pedestrian movement. *Environment and Planning B: Planning and Design*, 20(1), 29-66.
- Hillier, B. (1996). Cities as movement economies. *Urban Design International*, 1(1), 41-60.
- Hillier, B. (1999). Centrality as a process: accounting for attraction inequalities in deformed grids. *Urban Design International*, 4(3-4), 107-127.
- Hillier, B. (2001). *A theory of the city as object: or, how spatial laws mediate the social construction of urban space* [Paper presentation]. 3rd International Space Syntax Symposium, Atlanta, Georgia.
- Hillier, B., & Vaughan, L. (2007). The city as one thing. *Progress in Planning*, 67(3), 205-230.
- Hillier, W.R.G., Yang, T., & Turner, A. (2012). Normalising least angle choice in Depth Map-and how it opens up new perspectives on the global and local analysis of city space. *Journal of Space Syntax*, 3(2), 155-193.
- Iyer, L., & Maurer, N. (2009). The cost of property rights: Establishing institutions on the Philippine frontier under American rule, 1898-1918. *Harvard Business School BGIE Unit Working Paper*, 09-023.
- Jimenez Verdejo, J.R, Shuzo, F., & Umeya, K. (2015). Consideration on the street system of Binondo (Manila) and the composition of the block area. *Proceedings of the Architectural Institute of Japan* 80(709), 611-619
- Karimi, K. (2012). A reflection on 'Order and Structure in Urban Design.' *The Journal of Space Syntax*, 3(1), 38-48.
- Kueh, J. (2013). Adaptive strategies of Parian Chinese fictive kinship and credit in seventeenth-century Manila. *Philippine Studies: Historical & Ethnographic Viewpoints*, 362-384
- Kueh, J. (2014). *The Manila Chinese: Community, Trade, and Empire, c. 1570-c. 1770* [Doctoral dissertation, Georgetown University].
- Kirsch, S. (2017). Aesthetic regime change: The Burnham plans and US landscape imperialism in the Philippines. *Philippine Studies: Historical and Ethnographic Viewpoints*, 65(3), 315-356.
- Macas, T. (2014, October 16). *Burnham's century-old ideas can still be used to improve Manila – architect*. GMA Network New. <https://www.gma-network.com/news>
- Mayuga, J. L. (2016, November 9). *Palafox urges 'patriotic' urban planners: Help stop corruption*. Business Mirror. <https://businessmirror.com.ph/2016/11/09/palafox-urges-patriotic-urban-planners-help-stop-corruption/>
- Miller, S. C. (1982). *Benevolent Assimilation: The American conquest of the Philippines, 1899-1903* (4th ed.). Yale University Press.
- Morley, I. (2014, October). *City designing and nationhood during the early-1900s: Civic design in the Philippines*. Proceedings of the 15th International Planning History Society Conference, São Paulo. <http://www.fau.usp.br/iphs/abstractsAndPapersFiles/Sessions/33/Morley.pdf>.
- Morley, I. (2018). *Cities and Nationhood: American Imperialism and Urban Design in the Philippines, 1898-1916*. University of Hawai'i Press.
- Murphy, P., & Hogan, T. (2012). Discordant order: Manila's neo-patrimonial urbanism. *Thesis Eleven*, 112(1), 10-34.
- Ocampo, R. (1992, October). Planning and development of prewar Manila: Historical glimpses of Philippine city planning. *Philippine Journal of Public Administration*, 36(4), 305-327

- Oramas-Dorta, T. (2012). *Planned political capitals-from conceptual ideas to lived constructs: The case of Washington DC, Brasilia, Abuja and Astana* [Doctoral dissertation, University College London].
- Pante, M.D. (2017). Quezon's City: Corruption and contradiction in Manila's pre war suburbia, 1935-1941. *Journal of Southeast Asian Studies*, 48(1), 91-112.
- Pante, M.D. (2018). Modern living in third-world suburbia: Quezon City, 1939-1976. In S. Protschky & T. van den Berge (Eds.), *Modern times in Southeast Asia, 1920s-1970s* (pp. 15-38). Brill.
- Peponis, J., Wineman, J., & Bafna, S. (Eds.). (2001). *Proceedings of the 3rd international symposium on space syntax*. Georgia Institute of Technology, Atlanta, Georgia.
- Quirino, C. (1971). *Maps and views of old Maynila*. Maharnilad
- Ranada, P. (2017, December 7). *Duterte: Manila will be a 'dead city' in 25 years*. Rappler.com. <https://www.rappler.com/nation/190698-duterte-manila-dead-city-decentralization-philippines>
- Schnabel, C. (2018, March 20). *PCC approves deal to build gov't admin center at New Clark City*. Rappler.com. <https://www.rappler.com/business/198597-philippine-competition-commission-approval-bcda-mtd-capital-berhad-new-clark-city>
- Scott, M. (1969). *American city planning since 1890*. Berkeley and Los Angeles: University of California Press.
- Seekins, D. M. (1993). The first phase of United States rule, 1898-1935. In R. Dolan (Ed.), *Philippines: A country study* (4th ed.). Washington, D.C.: Federal Research Division, Library of Congress.
- Shepard, A. (1937). *Governmental aid and control of the growth of the city of Manila, 1900-1930*. [MA thesis in Political Science, University of Michigan].
- Shioda, T., Jimenez Verdejo, J.R., & Funo, S. (2012). Considerations on formation and street system of Intramuros (Manila). *Journal of Architecture and Planning (Transactions of AIJ)*, 77(681), 2499-2506.
- Soliven, P. S. (2018, May 17). *How the fame of Manila faded deviating from the 1905 Burnham grand plan*. The Philippine Star. <https://www.phil-star.com/other-sections/education-and-home/2018/05/17/1815876/how0-fame-manila-faded-deviating-1905-burnham>
- Spss, I. I. B. M. (2011). *IBM SPSS statistics for Windows, version 20.0*. New York: IBM Corp, 440.
- Taft, W.H. (1915). *The Philippine islands*. GH Paine.
- Turner, A. (2000). Angular analysis: a method for the quantification of space. *Working Paper 23*. Centre for Advanced Spatial Analysis, UCL, London.
- Turner, A. (2001). Angular analysis. In J. Peponis, J Wineman, & S Bafna (Eds.), *Proceedings space syntax* (pp. 30.1-30.11). 3rd International Symposium, Atlanta.
- Turner, A. (2005). Could a road-centre line be an axial line in disguise?. In A. van Nes (Ed.), *Proceedings of the 5th international symposium* (pp. 145-159). Space Syntax, TU Delft, Delft, Netherlands.
- Turner, A. (2007). From axial to road-centre lines: a new representation for space syntax and a new model of route choice for transport network analysis. *Environment and Planning B: Planning and Design*, 34(3), 539055. <https://doi.org/10.1068/B32067>
- van Nes, A (Ed.). (2005). *Proceedings of the 5th international symposium*. Space Syntax, TU Delft, Delft, Netherlands.
- Vernon, C. (2014). Daniel Hudson Burnham and the American city imperial. *Thesis Eleven*, 123(1), 80-105.
- Yang, T. (2015). A study on spatial structure and functional location choice of the Beijing city in the light of Big Data. *Proceedings of the 10th Space Syntax Symposium*, 119.