Integrating Space Syntax Analysis and Community Perceptions of Streetscape for Urban Conservation of Angono, Rizal

Lawrence F. Intalan[1]

lfintalan1@up.edu.ph

Abstract

Urban conservation is increasingly recognized as a vital aspect of sustainable development, preserving not only physical structures but also the cultural narratives that imbue spaces with significance. In the Philippines, the town of Angono in Rizal province is well-known for its rich cultural heritage, with a history deeply intertwined with its local arts, traditions, and community identity. Angono's heritage district, where the old streets are situated, represents an invaluable resource for both local and national heritage. However, as urbanization encroaches on this area, it becomes imperative to adopt strategies that ensure its cultural landscapes are preserved for future generations.

This research focuses on mapping the heritage district of Angono, Rizal, with the aim of advancing urban conservation. The study employs Space Syntax analysis and community perceptions of the urban streetscape as its primary methodologies. Space Syntax, a tool for analyzing spatial configurations, will provide insights into the changing patterns of movement, accessibility, and connectivity within Angono's urban fabric. This method will help to identify how new developments are influencing the town's spatial dynamics and streetscape character. Complementing this, an examination of community perceptions will offer a deeper understanding of how local residents experience and value these changes, providing a critical perspective on the impacts of urban transformation on social and cultural identity.

The result of the study reveals a strong correlation between the most integrated and connected streets, as identified by Space Syntax analysis, as well as the streets and landmarks most recognized by the community. Additionally, the maps demonstrate that key landmarks are clustered at specific urban nodes within Angono's heritage district, where much of the cultural heritage is concentrated. These insights can guide local government units (LGUs) in recognizing the value of urban conservation integrated in infrastructure planning, serving as a crucial resource for shaping both immediate and long-term development strategies.

Keywords: Urban conservation, Heritage district, Space syntax analysis, Cultural heritage, Community perceptions

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[1]Lawrence Intalan is a faculty member at the UP Diliman College of Architecture under the Urban Design Studio Laboratory. His research focuses on urban conservation anchored on the principles of sustainability. He is currently a member of the International Union of Architects (UIA) Community Architecture and Human Rights Work Programme.

I. Introduction

A. Urban Conservation: A Key to Sustainability

Urban conservation plays a crucial role in ensuring that cities and communities maintain their cultural identity while adapting to the challenges of urbanization and modernization. It is not merely about preserving physical structures, but also about safeguarding the intangible aspects of heritage, such as cultural narratives, traditions, and social practices. In this context, urban conservation aligns closely with the United Nations Sustainable Development Goal (SDG) 11, which calls for making cities and human settlements inclusive, safe, resilient, and sustainable. Particularly, SDG 11.4 emphasizes the need to strengthen efforts to protect and safeguard the world's cultural and natural heritage. By conserving heritage districts, urban conservation contributes to sustainable development by protecting spaces that embody historical significance, fostering a sense of identity, and enhancing the quality of life for future generations.

In addition to SDG-11, UNESCO's Urban Agenda, particularly the "Culture: Urban Future" report, highlights the critical role of culture in shaping sustainable urban development. The report emphasizes that culture should be at the heart of urban planning, especially in cities and towns with rich heritage like Angono. It advocates for integrating cultural heritage conservation with urban policies to ensure that modernization efforts do not erode the cultural fabric of communities. For heritage towns like Angono, where art, traditions, and local identity are integral to its character, this agenda reinforces the need to balance development with cultural preservation. By recognizing the value of culture as a driver of social cohesion and economic development, the "Culture: Urban Future" report provides a framework that aligns with the conservation goals of this research, ensuring that cultural heritage is not only preserved but also utilized to foster sustainable urban growth.

Internationally, the importance of urban conservation is underscored by the Washington Charter, adopted by the International Council on Monuments and Sites (ICOMOS) in 1987. The Washington Charter advocates for the conservation of historic towns and urban areas, emphasizing the need for urban planning strategies that preserve the character and cultural significance of heritage sites while allowing for their continued use and development. The principles outlined in the charter highlight that conservation must consider both physical preservation and the social, cultural, and economic factors

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that affect historic areas. This approach is especially relevant to towns like Angono in the Philippines, where the rich cultural heritage, deeply embedded in its arts and traditions, faces increasing pressures from urban expansion.

In the Philippines, Republic Act No. 10066, also known as the National Cultural Heritage Act of 2009, establishes a legal framework aimed at protecting, preserving, and conserving the country's cultural properties. Article IV focuses on Heritage Zones, which are areas of significant cultural and historical value that play a vital role in preserving the nation's heritage and fostering cultural identity. The Act defines these zones as locations that contain structures, sites, or landscapes of historical, cultural, or architectural importance. To protect these areas, it mandates measures that preserve their character, including restrictions on development and guidelines for restoration. Community involvement is emphasized, encouraging local residents to actively participate in conservation efforts. Overall, this framework balances sustainable development with the preservation of cultural heritage, ensuring it is safeguarded for future generations.

B. The Peri-Urbanization of Angono

Angono's location on the fringes of Metro Manila has made it a key site for peri-urbanization. The enhancement of road networks connecting the town to Metro Manila has spurred the transformation of its rural landscapes into a dynamic blend of urban and rural activities. What were once traditional rural streets have evolved haphazardly into areas of urban character, driven by rapid population growth and urban expansion. In the 1950s, Angono's aquatic resources began to decline due to the establishment of factories along Laguna de Bay. This industrial development, along with the gradual loss of agricultural lands, paved the way for the construction of residential subdivisions in the 1960s, '70s, and '80s, attracting migrants from densely populated areas such as Manila and Quezon City. Consequently, the town's population surged from 26,571 in 1980 to 113,283 by 2015 (PhilAtlas, 2020).

The decentralization of governance, brought about by the passage of the Local Government Code (RA 7160) in 1991, further catalyzed development across Rizal Province. Today, Angono is experiencing swift commercial growth and metropolitan-style pressures, as it has become a catchment area for Metro Manila's economic overflow. According to the town's 2017 Land Use Map, nearly half of its land is now built-up, with residential, commercial, and industrial uses dominating. The remaining 37.39% consists of agricultural lands, grasslands, and mining areas (Municipal Planning and Development Office, 2017).

Angono's limited land area for urban expansion is constrained by its proximity to Laguna Lake and areas with high slopes. As a result, commercial establishments and lower-income residential developments have sprung up across the town, leading to significant changes in its urban fabric. Traditional wooden vernacular houses are increasingly replaced by commercial structures and apartment rentals, with some new buildings rising several storeys high. In densely built areas, homes often encroach onto sidewalks, disregarding required setbacks, due to the scarcity of land. In the face of this rapid transformation, managing urbanization is crucial to preserving Angono's heritage district and maintaining a balance between development and cultural conservation.

Figure 1. Urban morphology of Angono from 1951 to 2021. *(Source: 1951 archival photo retrieved from Botong Francisco Museum)*

C. Balancing Economic Growth and Sustainable Urban Conservation

The CALABARZON Regional Physical Framework Plan (RPFP) 2004-2030 highlights the region's efforts to promote its rural and agricultural landscapes as key tourism assets (NEDA, 2006). With Angono's rich cultural heritage and renowned art scene, it is uniquely positioned to leverage this strategy being a first-class municipality that currently ranks 7th among 509 1st and 2nd class municipalities in the 2024 Philippine Cities and Municipalities Competitiveness Index. Unlike other municipalities in the region, Angono offers a blend of

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cultural history and artistic tourism, which presents both a development opportunity and a conservation challenge.

As part of CALABARZON's designated urban centers in Rizal alongside Antipolo, Cainta, Taytay, and Binangonan, Angono is central to regional efforts to streamline urban growth and socio-economic activity. These urban hubs aim to enhance economic development while carefully managing environmental and cultural sustainability. The goal is to optimize the use of urban infrastructure without compromising the town's environmental quality and historical heritage (NEDA, 2006).

Tourism in Angono relies heavily on the town's authenticity and the unique character rooted in its physical and cultural landscape. Visitors are drawn to its art and local traditions, yet maintaining this distinctiveness requires a careful balance between development and preservation. The challenge for Angono and its stakeholders lies in how to harness art tourism as a major economic driver while addressing the town's inadequate tourism infrastructure. This balance between economic growth and sustainable urban conservation will be key to Angono's future, as it seeks to develop without losing the unique qualities that make it a destination in the first place.

D. The Cultural Heritage of Angono

Angono's rich cultural history makes it an important site for heritage conservation. Known for its traditional art forms, particularly sculpture and painting, the town has produced national artists such as Carlos "Botong" Francisco and Lucio San Pedro, who have left indelible marks on Philippine art, music, and culture. Angono's vibrant cultural calendar features annual festivals and religious celebrations, such as the Feast of Saint Clement, the Higantes Festival, the Carabao Festival, and the Holy Week Processions, among others. These events, deeply rooted in Catholic faith and local traditions, are celebrated along the town's streets, further enriching its cultural landscape, and contributing to the strong imageability of its downtown area.

Figure 2. The Higantes Festival in one of the old streets in Angono.

Renowned as an artistic town with a distinct cultural identity and history, Angono is a thriving hub to numerous art exhibits, galleries, and art-themed restaurants and cafes, making it a cultural destination. The heritage district in Angono encompasses several landmarks that are important to the town's artistic legacy.

A significant part of its built environment is shaped by artistic interventions, such as urban sculptures, which have become closely intertwined with the town's cultural identity. The "Art Gallery on the Streets" in Barangay Poblacion Itaas, promoted by the Angono local government, is one striking example. Street walls here are adorned with intricate concrete murals, sculpted by Angono's skilled artists, that replicate the works of National Artist Carlos "Botong" Francisco. These murals, which depict panoramic scenes of Philippine history, customs, and traditions, are both a celebration of the town's rich heritage and a testament to its vibrant artistic community.

Public and private spaces throughout Angono, including schools, restaurants, and galleries, have also integrated these murals and urban sculptures into their facades, creating visual focal points and reinforcing the town's unique artistic character. Other urban sculptures, found along M.L. Quezon Avenue and Manila East Road, serve various functional purposes, from public shelters to memorial landmarks and storefront signage. However, many of these sculptures lack sufficient emphasis within the broader urban context, failing to assert themselves as distinctive landmarks.

Despite the wealth of cultural, social, and historical heritage embedded in Angono's streetscapes, much of the downtown has yet to be fully recognized for its role in representing the town's identity. These streets, with their unique character and deep connection to local history, hold significant potential to foster a sense of pride and encourage public stewardship among residents. Urban conservation in this context extends beyond the preservation of buildings; it also includes safeguarding intangible cultural practices, public spaces, and the old streets that contribute to Angono's identity.

II. Problem Setting

The forces of globalization have increasingly shaped urban development, leading to significant alterations in the spatial and cultural characteristics of cities and towns. This trend has resulted in the emergence of homogenized urban environments, where distinctive local features are often overshadowed by standardized urban forms. While such changes are frequently associated with economic growth and modernization, they present challenges to the preservation of unique place identities, particularly in rapidly urbanizing areas.

Angono, a municipality in close proximity to Metro Manila, exemplifies these pressures. Over the past several decades, Angono has experienced rapid population growth, primarily due to its strategic location as a catchment area for the capital's economic spillover. The influx of new residents and the subsequent demand for commercial and residential development have led to unregulated urban expansion, leading to rapid transformation of previously undeveloped land into densely populated areas. As a result, Angono's built environment is undergoing significant transformation, with new developments reshaping the urban streetscape,

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altering the town's traditional character and creating challenges in urban planning and governance.

This transformation raises critical concerns about the need for urban conservation in Angono. The rapid and uncoordinated urbanization, driven by global economic demands, has not only changed the town's physical structure but also threatens the preservation of its cultural identity as traditional landmarks and local practices are increasingly overshadowed by modern developments and commercial interests. In response to these challenges, this research emphasizes the importance of urban conservation to balance growth while protecting the heritage district.

A. Research Problem

The main objective of this research is to formulate a comprehensive approach to identifying urban spaces within Angono's heritage district that are significant for urban conservation initiatives. This methodology must effectively balance spatial analysis with community perceptions of urban streetscapes to preserve both the physical and cultural heritage of the area, while addressing the challenges posed by ongoing urbanization. As urbanization intensifies in Angono, there is a growing need to ensure that conservation efforts do not solely focus on preserving physical structures but also maintain the cultural narratives and social dynamics that give the heritage district its unique identity. The main challenge is to validate both the spatial characteristics of the urban landscape and the lived experiences of the community, while ensuring that future development harmonizes with the preservation of the town's cultural and historical heritage amidst increasing urbanization.

B. Sub-Problems

1) How does the spatial configuration of Angono's heritage district, as analyzed through Space Syntax, influence social interactions and movement patterns within the urban environment?

2) What are the community's perceptions and values regarding the heritage district's urban streetscapes, and how do these perceptions contribute to the cultural significance of the area?

3) How can the integration of Space Syntax Analysis with community feedback create a comprehensive methodology for urban conservation that addresses both spatial and cultural aspects of heritage preservation in Angono?

C. Goal of the Study

This study seeks to enhance understanding of the spatial and social dynamics that contribute to the complex study of urban conservation, informing sustainable urban planning practices that protect Angono's heritage district amidst increasing urbanization. The following objectives will guide this research:

1) Analyze the spatial configuration of Angono's heritage district using Space Syntax to understand how urban form influences social interactions and movement patterns.

2) Gather and assess community perceptions of urban streetscapes in Angono to identify how local residents value and experience the heritage district.

3) Integrate spatial analysis with community feedback to develop a holistic framework that informs urban conservation strategies tailored to both physical and cultural heritage preservation.

4) Propose recommendations for sustainable urban development that maintain the cultural identity and heritage of Angono amidst ongoing urbanization.

D. Significance of the Study

This study provides a comprehensive approach to urban conservation that balances both spatial and cultural dimensions, ensuring that Angono's heritage district is preserved in a way that respects its community's identity. By combining Space Syntax Analysis with local perceptions, the research offers a more nuanced understanding of how physical space and social interactions shape the urban environment. This integrated approach can serve as a model for other heritage towns facing similar pressures from urbanization and will highlight the importance of conserving the old streets and urban spaces as stated in Article IV of the National Cultural Heritage Act (RA 10066) which is pertaining to the designation of Heritage Zones and Districts.

Furthermore, the study contributes to the broader discourse on sustainable urban planning, emphasizing the need for development strategies that honor cultural heritage.

Ultimately, it aims to empower local stakeholders by involving them in the conservation process, ensuring that their voices are integral to the preservation of their community's history.

III. Review of Related Literature

A. Importance of Urban Conservation for Sustainable Urban Design

Urban conservation has become a critical component of sustainable urban design, as it seeks to preserve the unique cultural, historical, and social fabric of cities (Hillier & Hanson, 1984). The United Nations Sustainable Development Goal 11 emphasizes the importance of making cities and human settlements inclusive, safe, resilient, and sustainable, which aligns with the goals of urban conservation (Roseland & Spiliotopoulou, 2016). Additionally, the UNESCO Urban Agenda and the Washington Charter have recognized the significance of preserving cultural heritage and integrating it into urban planning and development. In the context of the Philippines, the Republic Act 10066, also known as the "National Cultural Heritage Act of 2009," specifically addresses the designation of Heritage Zones. This legislation underscores the government's commitment to protecting and conserving the country's cultural heritage,

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which is vital for maintaining the identity and character of urban areas (Rani et al., 2018).

Conservation of built heritage and cultural assets not only preserves the historical and cultural identity of a city but also offers economic, social, and environmental benefits. For instance, urban conservation can support economic development by promoting tourism and cultural industries, which can generate employment and income for local communities (Rani et al., 2018). Furthermore, the preservation of traditional building techniques and materials that often utilize locally sourced, renewable, and energy-efficient resources can contribute to a more sustainable built environment, reducing the carbon footprint and resource depletion associated with modern development practices (Sing & Sasaki, 2016).

Beyond the physical aspects, urban conservation also helps to maintain the social fabric and community identity of historic urban centers. The preservation of traditional functions, activities, and social interactions within these areas can foster a sense of belonging and community pride among residents, enhancing social cohesion and well-being.

Fostering collaboration among stakeholders—such as conservation professionals, local communities, and other relevant groups—is essential for the effective planning and execution of urban conservation efforts. By integrating the expertise of these diverse stakeholders, conservation efforts can better address the multifaceted challenges and opportunities present in historic urban areas, ensuring that the preservation of cultural heritage is aligned with the sustainable development of the city (Lo et al., 2015) (Lee & Shih, 2018).

B. The Role of Space Syntax Analysis in Urban Conservation

Space syntax analysis is a widely recognized tool for understanding the spatial configuration and connectivity of urban environments. This approach examines the relationships between different spaces and how these spatial interactions shape human movement and behavior within the urban environment (Jiang & Claramunt, 2002) (Lo et al., 2015). Through the structural analysis of an urban setting, space syntax can provide valuable insights into the evolution of urban areas and the design of new urban layouts. By considering the degree of integration and connectivity between various urban spaces, space syntax analysis can help identify the critical spatial elements that contribute to the overall character, function, and usage patterns of a historic district or a heritage site (Jiang & Claramunt, 2002) (Jiang et al., 2000).

Studies have shown that the spatial configuration of urban streetscapes can significantly impact pedestrian movement and community interaction. By examining key spatial properties, such as connectivity, integration, choice, and centrality, space syntax analysis can reveal the extent to which various nodes, corridors, and public spaces within the urban fabric are utilized and perceived as important by the local community (Lo et al., 2015) (Sing & Sasaki, 2016).

Furthermore, space syntax analysis has been increasingly applied also to the study of historic urban areas, providing valuable insights into the spatial characteristics and patterns that contribute to the cultural significance, social vibrancy, and community engagement within these environments (Mariana et al., 2017) (Lo et al., 2015). This information can inform the prioritization of conservation efforts, guiding the identification of critical areas that require intervention to maintain or enhance their cultural and social significance.

Moreover, space syntax analysis can also be applied to assess the potential impacts of proposed conservation or redevelopment projects on the existing spatial dynamics and community perceptions. By simulating the effects of changes in the built environment, such as the preservation or adaptive reuse of historic buildings, the reconfiguration of public spaces, or the introduction of new transportation infrastructure, space syntax can help predict the implications for pedestrian movement, accessibility, and the overall sense of place.

C. Integrating Community Perceptions in Urban Conservation

While space syntax analysis provides an objective understanding of the spatial characteristics of the urban environment, the incorporation of community perceptions is essential for developing conservation strategies that truly reflect the needs and aspirations of local residents. Community engagement and participatory approaches can help uncover the cultural, social, and emotional values that community members associate with historic urban areas, which may not be readily apparent through the spatial analysis alone.

Engaging with the local community can reveal the unique place-based meanings, traditional practices, and social interactions that contribute to the character and identity of a historic urban area. This information can then be integrated with the findings from the space syntax analysis to inform conservation strategies that prioritize the preservation of cultural heritage while also enhancing the well-being and sense of community for residents.

By integrating space syntax analysis and community perceptions, urban conservation efforts can strive to achieve a balance between the preservation of cultural heritage and the sustainable development of the city, ultimately contributing to the realization of Sustainable Development Goal 11, which aims to make cities and human settlements inclusive, safe, resilient and sustainable.

D. Integrating Technological Tools in Urban Conservation Practices

The integration of advanced technological tools, such as geographic information systems, has further enhanced the application of space syntax analysis in urban conservation efforts. These tools can provide a more comprehensive understanding of the spatial and visual qualities of historic urban areas, allowing for the simulation and evaluation of proposed conservation interventions before implementation.

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Additionally, the use of participatory mapping and other community engagement techniques facilitated by digital platforms can amplify the voices of local residents, ensuring that their perceptions, needs, and aspirations are effectively integrated into the conservation planning process. This inclusive approach not only fosters a collaborative environment that encourages diverse input but also cultivates a sense of ownership among residents, empowering them to actively contribute to the stewardship of their cultural and natural heritage.
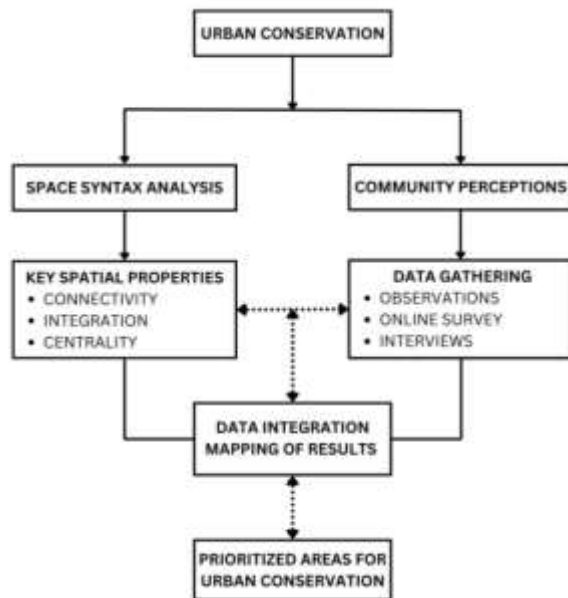
IV. Conceptual Framework

Figure 3. Visual representation of the Conceptual Framework highlighting the key components and their relationships.

The conceptual framework for this research focuses on Urban Conservation, illustrated through a diagram that highlights two key components: Space Syntax Analysis and Community Perceptions. Space Syntax Analysis serves as a crucial tool by examining spatial properties such as connectivity, integration, and centrality, which clarify how urban spaces are used and their importance within the urban landscape. This quantitative approach provides valuable insights into the structural relationships that define urban environments.

In conjunction with this, Community Perceptions are gathered through various data collection methods, enabling researchers to investigate the cultural, social, and emotional values that communities associate with the heritage district. This approach not only captures residents' nuanced experiences but also promotes engagement in the conservation process.

By synergizing these two components, the framework not only fosters a comprehensive understanding of urban conservation priorities but also ensures that interventions are grounded in both spatial analysis and the lived experiences of the community, ultimately promoting sustainable and context-sensitive urban development.

IV. Methodology

A. Mapping of the Streets of Angono

The research involved creating a detailed street map of Angono within the defined geographical scope of the study. This map was essential for developing visual narratives and illustrating the results of the online survey using spatial data. The map was drawn using CAD software, with a base image from OpenStreetMap (OSM) that served as a guide for tracing. To ensure accuracy, the image was scaled in CAD to approximate the correct street dimensions, particularly street lengths and widths. These measurements were initially estimated using Google Earth, and later cross-checked with data on the Local Road Network and Right-of-Ways obtained from the Angono Municipal Planning and Development Office (MPDO) and the Angono Engineering Office (AEO).

Figures 4 & 5. The study will focus on the downtown street map of Angono Rizal, where the heritage district is located (shaded in gray).

A historical 1876 reconnaissance map of Angono, titled "Croquis del pueblo de Angono y suscercanías: Hoja 9a," prepared by Obras Públicas engineer Eduardo Lopez Navarro (Spanish National Archives, 1876), was utilized to validate and confirm the street patterns of the old pueblo settlements that existed during the Spanish colonial period (Figure 6). This map provides detailed information on the natural landscape and the location of key infrastructure in Angono at the time. The data extracted from this map served as a foundational reference for identifying the old streets and the early settlements area that formed the basis for Angono's heritage district. These streets remain in existence today and continue to serve functionally, offering easy accessibility and strong connections to key commercial hubs in the downtown area.

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Figure 6. An 1876 map entitled: CROQUIS del pueblo de Angono y suscarcenias (Sketch of the town of Angono and its surroundings) *prepared by Engineer Eduardo Lopez Navarro. Source: Spanish National Archives*

Figure 8. Urban morphology and street development of downtown Angono from 1876 to present.

Figure 7. A map illustrating the old streets and settlements in Angono based on the old 1876 Hacienda de Angono map overlaid with the existing streets.

The street development of Angono originated from its heritage district, as illustrated in Figure 8 (shaded in gray). In the post-war period, from the late 1940s to the 1950s, new streets were constructed on both sides of the heritage district, aligned parallel to the Angono River and extending from the northeastern mountains down to the shores of Laguna de Bay in the southwest. Many of these streets became integral parts of residential subdivisions developed between the 1960s and 1980s, gradually expanding northwestward toward the neighboring town of Taytay. This period of expansion was marked by the emergence of diverse residential communities, reflecting the growing population and changing demographics in Angono. As a result, the infrastructure not only accommodated an increasing number of residents but also facilitated economic activities, further intertwining the town's urban development with its historical context and natural landscape.
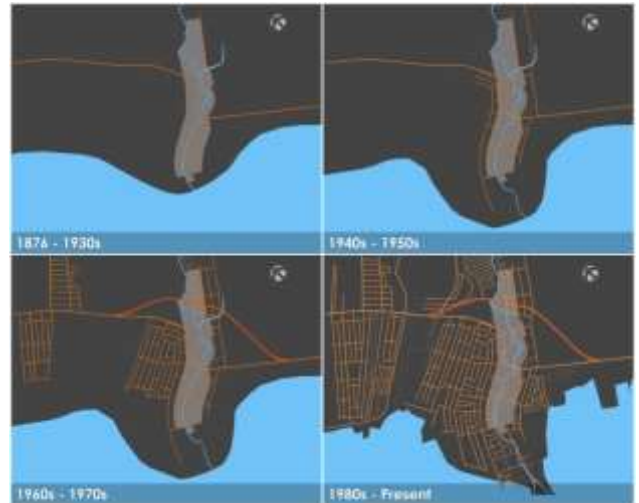
B. Mapping the Heritage District using Space Syntax Analysis

Space Syntax analysis, conducted using DepthMap, was employed to identify the most integrated and connected streets within the urban landscape. In this analysis, streets are depicted as Axial Lines, with a color-coded spectrum indicating their levels of integration: warm colors (red, orange, and yellow) represent the most integrated streets, while cool colors (green, blue, and violet) indicate those with lower integration. An Axial Line is defined as the longest sightline in the urban environment, representing potential movement pathways. In the context of urban studies, each axial line corresponds to a public urban space that connects with other public areas (Yamu, van Nes, & Garau, 2021).

For this study, three fundamental concepts of space syntax—Connectivity, Integration, and Choice—were employed to evaluate and analyze the street network of Angono. Connectivity is a static, local measure that quantifies the number of connections each street has to its immediate neighboring streets. A street with many connections to adjacent streets has a high connectivity value, while a street with fewer connections has a low connectivity value. Integration, on the other hand, assesses the degree of accessibility a street has to all other streets within the urban system, taking into account the total number of direction changes required to navigate from one street to another. The fewer the direction changes needed to reach other streets, the higher the street's integration and, consequently, its interaccessibility. In essence, integration is closely related to connectivity; longer axial lines in an urban area generally indicate higher connectivity to other lines and, in turn, higher integration values (Yamu, van Nes, & Garau, 2021). Choice measures the likelihood that an axial line or street segment will be traversed on the shortest routes between all spaces within the entire system (Hillier, Burdett, Peponis, & Penn, 1987). It reflects how each segment fits into the least angular routes between all pairs of segments, thereby illustrating potential through-movement and establishing an urban route hierarchy (Hillier, 2008).

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Space syntax studies indicate that streets with minimal angles or a straight alignment, represented in warm colors, closely reflect how people navigate urban spaces (Hillier & Iida, 2005). This suggests a higher level of accessibility to surrounding streets, emphasizing the potential of these routes to serve as both destinations and pathways for pedestrian movement. In contrast, curved or winding streets, depicted in cool colors, tend to show lower integration, suggesting they are less effective at facilitating direct movement and connectivity within the urban environment.

Figure 9. Street map showing the relationship of the old district of Angono with the most integrated and connected streets.

C. Survey of Community Perceptions of Urban Streetscape

The second phase of the study delves into the spatial cognition and mental mapping of local residents within their everyday environment. This exploration aims to capture the subjective spatial experiences of the respondents. The study employs a visual recognition task presented through an online survey platform. Respondents are shown a curated series of street photographs carefully selected to showcase salient urban features such as sculptures, landmarks, and historical streets. These images act as visual cues, prompting participants to identify the specific street name depicted, the barangay (local administrative division) it falls under, and the nearest recognizable landmark. This exercise aims to understand how the respondents navigate and mentally organize their surroundings based on visual cues. The collected data is then tabulated and ranked, culminating in the creation of a composite mental map illustrating the location of the most recognized streets and landmarks. This map provides a geographically grounded visualization of the area as perceived and interpreted by the respondents, highlighting commonly recognized areas and potential discrepancies in spatial awareness.

V. Results and Findings

A. The Most Integrated and Connected Streets in Angono

Based on the space syntax map shown in Figure 10, the most integrated streets in warm colors are located in the heritage area. For instance, Doña Aurora St. (Brgy. Poblacion Itaas), Capt. Allano St. (Brgy. Poblacion Itaas) to Garcia St. (San Vicente), and Doña Victoria St. to Don Justo Guido St. (San Pedro) are all color red which confirm their high connectivity to other adjoining streets that cross it.

As per empirical evidence, these streets are the preferred routes leading to the St. Clement Parish church, the Carlos Francisco Museum, the concrete wall murals, as well as the Blanco Family Museum which are popular tourist destinations. Furthermore, residents from Brgy. San Vicente and Brgy. Sto. Niño navigate along these streets as a shortcut or alternate route going to Balite and to the public market area along M.L. Quezon Avenue (San Roque), either by walking, biking and riding the tricycle. This confirms the accessibility of these streets to the pedestrian and the vehicular movement of the people as evidenced in Table 1 with their highest values in Integration, Connectivity, and Choice.

Street Names	Axial Line	Integra-tion	Connecti-vity	Choice
Doña Aurora (Pob. Itaas)	507.47	1.5093	7.00	1653.0
Doña Aurora (Pob. Ibaba)	295.46	1.2196	4.25	857.75
Doña Aurora (San Roque)	319.57	1.0945	4.50	950.0
M.L. Quezon (San Isidro)	223.61	1.2309	6.20	536.6
M.L. Quezon (San Roque)	233.59	1.3622	6.00	1706.5
A. Tiamson (Paso)	161.62	1.0471	4.00	1473.0
Capt. Allano-Garcia St.	329.07	1.6155	11.00	5079.0
E. Dela Paz	192.66	1.2308	3.75	197.0
E. Rodriguez	246.99	1.2352	3.75	1354.25
A. Ibañez	353.55	1.0270	5.38	1093.13
Doña Nieves	263.17	1.2227	5.00	731.40
M. Diaz St.	198.94	1.2791	6.00	661.00
P. Tolentino	144.54	1.1534	5.00	223.00
R. Tolentino	177.25	1.0781	6.00	1047.00
Col. J. Guido	421.31	1.0277	4.33	947.33
Don J. Guido	362.25	1.3349	8.00	1735.50
Doña Victoria	201.91	1.4719	10.50	1677.00
J. Sumulong	212.88	1.1977	4.33	84.00
Capt. Blas	100.70	0.9839	2.33	86.00

Table 1. Space Syntax data used to evaluate the street network of Angono (Axial Line, Integration, Connectivity, and Choice)

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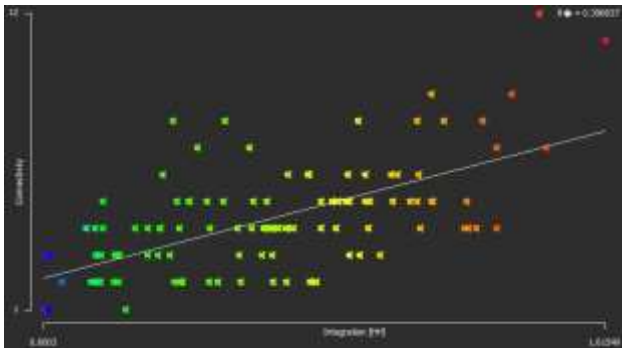**Figure 10.** Street map with Axial Lines showing the most integrated and connected streets in Angono

Figure 11. Scatter plot showing the correlation of Connectivity and Integration. *R2 = 0.396837(Plotted using DepthMapX)*

The Balite junction, which is a busy node in the heart of the downtown, is color red. From Balite, the color changes to orange going towards the public marketarea up to Lt. Col. Jose Guido St. In the same way, Doña Aurora St. in Brgy San Roque from Balite is changing gradually from "red-to-orange-to-yellow" spectrum going towards Manila East Road. The M.L. Quezon Avenue, which is the "main street" of Angono from Paso junction, to Munsipyo junction, up to Balite junction is consistently orange colored. This corresponds with its existing commercial land-use where banks, lending companies, medical clinics, pharmacies, salons, cafes, food stalls, and hardware stores could be found. On Manila East Road from the boundary between Angono and Taytay up to the Angono Public Cemetery, is within the color spectrum from "red-to-orange-to-yellow." These are where most of the residential subdivisions are located with the presence of commercial buildings on their corner plots. Other streets within the spectrum of orange-to-yellow colors are E. Dela Paz St., Don Justo Guido St., Lt. Col. Jose Guido St. in the southeast and E. Rodriguez St., Doña Nieves St., and A. Ibañez St. in the northwest. These streets are currently classified as residential in the latest Land-Use Plan of Angono.

Based on these indications, the spatial configuration of the street network of Angono influences the flow of human movement and the location of shops and residences in the

built environment. There is a causal relationship between space, movement, and economic activities. The more spatially integrated a street is, the higher the flow of people movement and the more attractive the land along that street is for economic activities. This is based on the Theory of Natural Movement, often referred to as the Natural Movement of Economic Process (Yamu, van Nes, & Garau, 2021). This theory explains how the built environment functions independently of planning processes regarding socioeconomic activities. The process is influenced and changed through urban interventions such as new street links. It is interesting to note that it is not movement and urban attractors that influence the street network's spatial configuration, but rather the street network's spatial configuration that is decisive for movement and for the optimum location for economic activities.

Interestingly, the majority of the streets with high spatial connectivity represented by warm colors are situated within the old district of Angono. This is illustrated in Figure 9 showing the space syntax map with the overlay of the Angono old district in color gray. It further gives us an insight of the urban pattern of Angono and the social organization of the settlements are deeply engrained to the configuration and spatial layout of its old streets where high pedestrian and vehicular movement transpire over the years. These old streets are shown in Table 2.

Present Street Names	Old Street Names	Connectivity	Color Range
M.L. Quezon (San Isidro)	Camino de Taitai	Mid-high to Mid-low	Orange to Green
M.L. Quezon (San Roque)	Camino de Binangunan	High to Mid-high	Red to Orange
Doña Aurora (Pob. Itaas)	Calle Real (Ibaba)	High to Mid-low	Red to Green
Capt. Allano (Pob. Itaas)	Baraka	High	Red
Doña Aurora (San Roque)	Calle Real (Itaas)	High to Mid	Red to Yellow
Paso (San Roque)	Paso	Mid	Yellow
E. Dela Paz St. (San Pedro	Calle Rosario	Mid-high	Orange
E. Rodriguez (Sto. Niño and San Vicente)	Calle Vicente	Mid-high to Mid-low	Orange to Green

Table 2. Old streets of Angono with high pedestrian and vehicular movement based on Space Syntax (Integration and Connectivity)

B. Mapping the Most Recognized Streets in Angono

Figure 12 illustrates the location of the most recognized streets in the street map. This will better analyze the location and context of the areas where the photographs are taken. Consequently, the respondents are very acquainted to these places due to their frequent experience in traversing these streets. Furthermore, it is assumed that the various urban elements in between these recognized spaces are also familiar to them. Throughout the process of navigating these streets, the respondents are likely to absorb all the information and make their observation. Based on the illustrated map, eight of these ten recognized

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places are located along the three major roads of Angono, namely: Manila East Road, M.L. Quezon Avenue, and Lt. Col. Jose Guido Street, forming a continuous loop. These three roads have been the main channels of circulation in Angono downtown, intersecting with the minor roads and creating significant nodes and gateways to residential districts. Buildings and various business establishments surrounding these nodes often served as landmarks and key points when people gave directions. Most of the urban sculptures funded by the Angono LGU are also located along these streets utilized functionally either as public sheds, memorial landmarks, and commercial signage.

Figure 12. Street map showing the locations of the most recognized streets based on the survey.

C. Mapping the Most Recognized Landmarks in Angono

Figure 13 is a street map illustrating the location of the most recognized landmarks in Angono. These are clustered and represented by corresponding color according to their rankings to indicate the level of recognition. Using the color spectrum, the landmarks are categorized as follows:

- Red for landmarks with more than 100 counts.
- Blue for landmarks ranging from 51-99 counts.
- Green for landmarks ranging from 31-50 counts.
- Purple for landmarks ranging from 10-30 counts.
- Teal for landmarks with less than 10 counts.

A total of fifty (50) recognized landmarks were recorded and tabulated from the survey. Based on the map illustration, we could see that the recognized landmarks are coinciding with the location of the recognized street photographs. These are mostly clustered around the nearest streets, nodes or junctions, buildings, establishments and neighborhoods. It was intended to document all the landmarks that were revealed in the survey even for the least mentioned ones, to delineate the level of distinction of the respondents' subjective perceptions. By doing this, we could determine if there are noticeable patterns in the recognized landmarks which could be further discussed for evaluation.

Figure 13. Street map showing the location of the most recognized landmarks with the most recognized streets.

D. Integrating the Most Recognized Streets and Landmarks with Space Syntax

Figure 14 shows the space syntax map with the overlay of the most recognized street photographs and landmarks based on the survey results. With these findings, space syntax was able to determine and reveal the specific places in Angono which are predominantly located at road junctions with high pedestrian and vehicular movement.

This illustration confirms the strong association of the most recognized landmarks in Angono with the most integrated and connected streets which are situated within the same vicinity. This correlates also to the degree of vitality and the high visibility in these urban areas which are the specific locations of economic activities.

As seen in the map, the concentration of the most recognized landmarks is clustered and located at Nodes where the observer can enter and perceive. These junctions are places of break for pedestrian and vehicular movement. People heighten their attention and recognize nearby elements at these junctions with more precision (Lynch, 1960). Thus, urban elements located at nodes are more prominent from their location. These are popular and significant landmarks that give identity to the place like the church, the municipal hall, the public market, and longstanding shops and stores which have become part of the Angono culture.

Looking ahead, these specific urban zones and streets could serve as "focus areas" for the Local Government Unit (LGU) in the future planning and development of Angono, acting as strategic nodes for urban revitalization. These areas could be designed as "gateways," promoting a distinct character and identity that reflect the community's cultural heritage. The scope of development should be guided by the contextual boundaries of landmark clusters as illustrated in Figure 14, ensuring that new initiatives enhance the existing urban fabric while preserving the historical and cultural significance of the area.

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Figure 14. A street map illustrating the relationship between the most recognized streets and landmarks in Angono, organized into clusters that align with the most integrated and connected streets.

E. Integrating the Routes of Religious Processions and Annual Festival Parades with Space Syntax

The routes of religious processions and annual festival parades, such as the Feast of St. Clement (Angono Town Fiesta), *Semana Santa* (Holy Week) Processions, and the *San Isidro* Festival, are plotted to highlight their connections with the most integrated and accessible streets of Angono. This mapping confirms that the spatial layout of Angono's old streets and heritage district has significantly influenced the movement of people over the years, encompassing socio-cultural, socio-economic, and religious activities. The overlaid map illustrates the correlation between these vibrant activities and the old streets characterized by high pedestrian traffic. These culturally rich events, deeply rooted in Catholic faith and traditions, have positively contributed to the identity and significance of Angono's old streets within the community.

The Higantes Festival, which was previously co-celebrated with the Angono Town Fiesta, features giant papier-mâché and serves as a secular celebration to express gratitude to St. Clement. This annual event is initiated by the Municipality of Angono to promote its cultural tourism.

This festival parade established a new route along M.L. Quezon Avenue, beginning at the Angono Diversion Road and concluding at the Angono Municipal Complex, making it more visible and accessible to tourists and visitors alike.

Figure 15. Street map showing the location of routes of religious processions, annual festival parades, cultural landmarks, and religious art/statues within the most integrated and connected streets of Angono.

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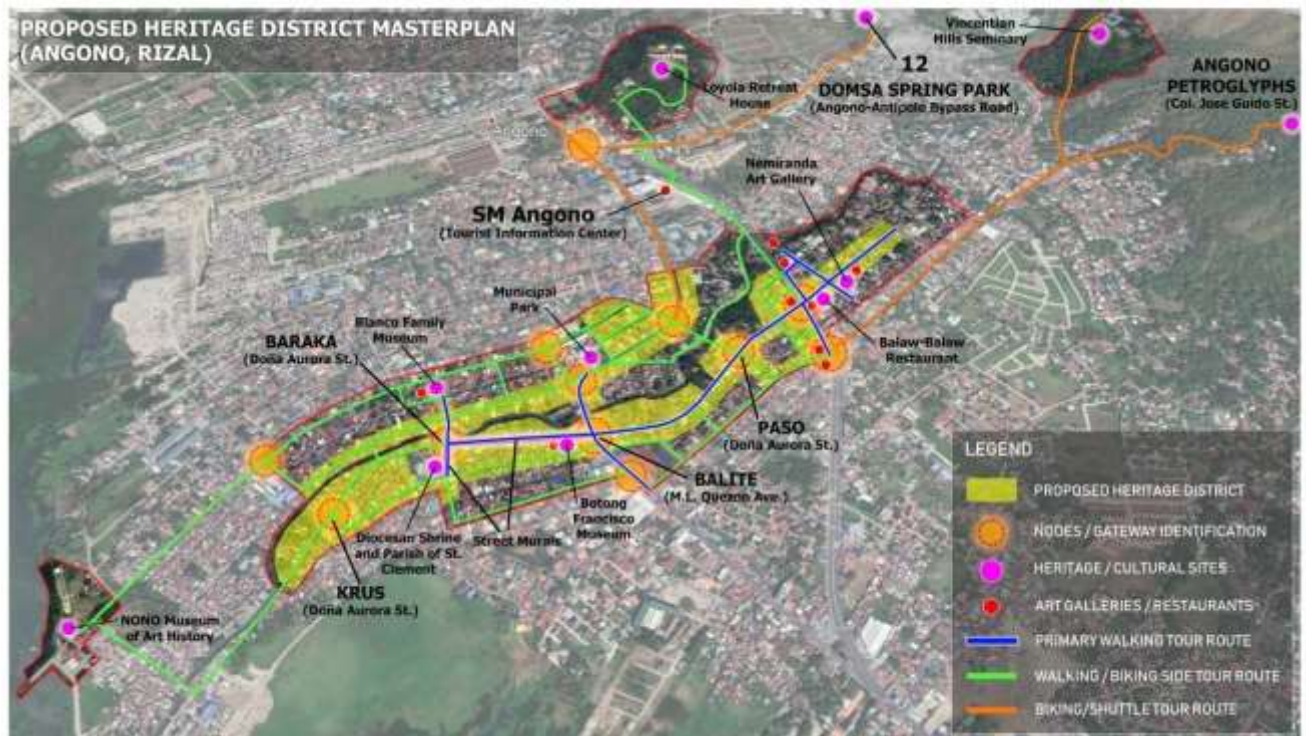## F. Moving Forward: Utilizing Space Syntax for Urban Conservation

Figure 16. The proposed Angono Heritage District Masterplan showing key tourist attractions and suggested streets for walking tour.

Space Syntax demonstrates the cognitive complexity and predictive capability of urban design proposals in relation to their future socioeconomic impacts (Yamu, van Nes, & Garau, 2021). As illustrated in Figure 10, areas and streets in Angono with high to medium connectivity, represented by red to yellow, have been identified. These streets, currently neglected, possess the potential for revitalization and integration into the existing urban network. For example, pedestrian links between the two districts could connect Doña Aurora Street in Brgy. San Roque and Brgy. Poblacion Itaas, enhancing accessibility and fostering community interaction. Figure 16 above outlines the primary walking tour route (in blue), which runs along Doña Aurora Street and features proposed gateway nodes at Baraka, Balite, Paso, and Manila East Road.

Figure 17. A visualization of the reimagined *Balite*, envisioned as a gateway node for the heritage district.

The high connectivity characteristics of Brgy. Poblacion Itaas can be extended to the northern portion of Doña Aurora Street, reaching the art galleries located within the node of Manila East Road, including the Balaw-Balaw Restaurant and Nemiranda Arthouse. Doña Aurora Street can be envisioned as a shared street that showcases an array of houses in traditional architectural styles, thereby reimagining the narratives of Calle Real as Angono's historical thoroughfare. The proposed node at Balite will establish a new gateway identity in the heart of downtown (Figure 17), becoming a focal point of interest along the entire length of Doña Aurora Street (930 meters) from the nodes of Baraka to Paso. This transformation will set the tone for the area as the historic "main street" of Angono.

Figure 18. A visualization of the reimagined Doña Aurora St. with textured road surfaces (paver bricks), curbless sidewalks (shared street), and buildings with traditional architectural style.

As depicted in Figure 18, the proposed pedestrian link along Doña Aurora Street could serve as a route for walking tours, invigorating the street with quaint art galleries, craft stores, specialty food shops, and alfresco cafés. This revitalization aims to restore the street to its former glory as the Calle Real of Hacienda de Angono

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while promoting inclusive local tourism through active community participation. This urban design strategy seeks to connect existing art galleries and restaurants along Manila East Road, extending to Balite—the heart of downtown—and leading towards popular tourist destinations such as the Carlos Botong Francisco Museum, the concrete wall murals, St. Clement Parish Church, and the Blanco Family Museum, thereby enriching Angono's cultural landscape.

VI. Conclusion

In conclusion, the findings from the space syntax analysis, community perceptions, and urban morphology studies collectively underscore the significance of Angono's old streets. These streets are vital for preserving cultural heritage and serve as a foundation for promoting community engagement and sustainable urban development.

The application of space syntax analysis has demonstrated that the spatial configuration of Angono's historic street network significantly influences patterns of human movement and the distribution of settlements, particularly those associated with cultural heritage. The analysis indicates that the old streets of Angono exhibit high spatial integration, as evidenced by substantial pedestrian and vehicular traffic that supports various economic activities within these areas. This movement not only facilitates economic interactions but also enhances social connectivity and cultural exchange.

Furthermore, insights obtained from an online survey conducted among community members highlight the critical role of these streets in identifying significant places and landmarks that contribute to Angono's urban identity. The maps derived from the survey results confirm that the most recognized streets and prominent landmarks are strategically located at nodes within the heritage district of Angono. This observation aligns with Kevin Lynch's theory, which posits that urban elements situated at nodes are inherently more prominent due to their visibility and accessibility.

Urban morphology studies further elucidate the historical, cultural, and social contexts that have shaped the development of Angono's streets and settlements. These studies reveal the essential function of streets not only as conduits for movement but also as integral components in preserving and promoting Angono's cultural heritage and traditions. Maintaining these streets is crucial for ensuring the continuity of the community's history and identity.

The data-gathering process represents a significant advancement in engaging the community in an evidence-based approach to urban design. This approach aligns with Amos Rapoport's argument that the meanings attributed to environments by public users are paramount, exceeding the interpretations of architects and urban designers. By actively involving community members in the planning process, we empower them to become stewards of Angono's old streets, fostering a sense of ownership and responsibility that encourages active participation in the preservation and enhancement of their environment.

Additionally, community involvement creates opportunities for local residents to contribute to the beautification of streets and public spaces in ways that are relevant and adaptable to their cultural practices. By incorporating local knowledge and perspectives into the design process, urban planners can create public spaces that accurately reflect the community's identity and meet its needs, ultimately contributing to the sustainable development of Angono.

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