Connectivity of Dinoyo Ceramic Tourism Kampong Based on Space Syntax Analysis

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ABSTRACT

Dinoyo Ceramic Tourism *Kampong* in Malang City has been a significant centre for ceramic craftsmanship since the 1930s, blending industrial activities with cultural tourism. However, the village faces connectivity challenges in spatial management, including narrow roads, limited public facilities, and complex circulation patterns that hamper accessibility and the visitor experience. The objective of this research is to analyse the spatial connectivity of the *kampong* using the Space Syntax method (DepthMapX software) to identify problematic areas and propose improvements. Space Syntax analysis (focusing on the connectivity parameter) reveals that linear, well-connected circulation patterns encourage higher spatial clarity and social interaction. In contrast, areas with many branching routes and no clear open spaces reduce users' ability to comprehend and navigate the village effectively. The connectivity analysis highlights key circulation nodes (segments) that act as essential connectors, while also identifying multiple segments with very low connectivity due to their fragmented and dead-end layout. These findings suggest that targeted spatial interventions—such as adding strategic footpaths, widening or linking dead-end alleys, improving signage, and managing vehicle traffic—could significantly improve road connectivity and spatial legibility. By implementing these post–Space Syntax recommendations, the *kampong*'s visitor movement and circulation can be enhanced, supporting sustainable tourism development and improving the spatial management of the Dinoyo Ceramic Tourism *Kampong* as an educational and cultural destination.

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1. INTRODUCTION

Spatial configuration is a critical aspect of urban planning and design, as it determines how physical elements like buildings, roads, and open spaces are arranged to support human activities [1], [2]. One crucial element of spatial configuration is connectivity, which refers to the degree to which spaces are directly linked to one another. Good connectivity allows fast and efficient access, both in the context of human movement

and the distribution of goods and services. Regions with high levels of connectivity tend to be more productive, dynamic, and support economic growth, compared to areas with low levels of connectivity [3], [4]. The importance of connectivity is not only seen on a micro scale, such as the layout of roads in an urban area, but also on a macro scale, including relationships between regions or cities. For example, the availability of an integrated transportation network can reduce travel time, increase energy efficiency, and support the development of strategic areas. On the other hand, areas with low connectivity often face challenges in accessing economic opportunities, education, and social services, which can ultimately exacerbate development gaps. Therefore, understanding and optimising spatial configurations with a focus on improving connectivity is an essential step in supporting sustainable, inclusive, and future-oriented planning. Areas with high connectivity tend to be more accessible and productive, whereas poorly connected areas face challenges in accessing opportunities and services [5]. In architectural theory, Hillier's space syntax concept frames space as a configuration of interrelated spaces, emphasising that the relationship between different spaces (rather than isolated rooms) shapes how people perceive and navigate the environment. This means that how streets and pathways connect influences psychological comfort, wayfinding, and the overall usability of a place.

Tourism *kampong*s (village neighbourhoods) in Indonesia have become a focus of development as thematic attractions, yet their spatial layouts are often organic and unplanned. Malang City, for example, has several urban villages designated as tourism *kampong*s, each with its unique theme (ceramics, colourful murals, heritage, etc.). Dinoyo Ceramic Tourism *Kampong* is a prime example—a historic village known as a ceramic craft centre since 1930. Located in RW 03 of Dinoyo Village, Lowokwaru District, this *kampong* embodies the community's generations-long skill in transforming clay into ceramics, evolving from simple earthenware to high-quality porcelain crafts. In recognition of its cultural value, the Malang City Government formally designated Dinoyo as an "Educational Tourism Village" in 2010 and has since organised ceramic festivals to promote it. The village today has a significant cluster of home-based ceramic industries—31 members were recorded in the local craft association by 2016, with 16 actively producing ceramics (the rest engaged in related gypsum or other crafts) [6], [7].

Despite its cultural significance and economic potential, Dinoyo Ceramic Tourism *Kampong* faces urgent spatial challenges that hinder visitor circulation and overall development. The area's organic growth has resulted in narrow, winding roads and alleys, some only 1–2 meters wide, which complicate pedestrian movement and vehicle access [8], [9]. There is a lack of public facilities, including dedicated parking areas, clear pedestrian pathways, and open public spaces. The main road (approximately 3.5 m wide) often becomes congested, serving as an alternative traffic route for the city, and it lacks sidewalks for safe walking. Additionally, spatial density and mixed land uses create competition for space. Many residents run ceramic showrooms out of their homes due to limited land, and some homes double as boarding houses for students, given the proximity of universities. Key public facilities (e.g. a mosque, Dinoyo II Elementary School, and a health centre) are located along the main village road, generating daily crowds and traffic at certain hours. These overlapping uses mean that tourists navigating the *kampong* often encounter traffic congestion and may struggle to locate craft shops that are tucked away in residential lanes.

Amid these challenges, a clear research gap exists in understanding the spatial structure of Indonesian tourism *kampong*s, such as Dinoyo, through quantitative analysis. Prior studies on tourism villages have mainly addressed marketing, attractions, or community empowerment, with few examining the physical spatial connectivity that underpins visitor movement and experience [8]. While space syntax techniques have been applied to analyse markets and urban districts in Indonesia, they have rarely been used to evaluate tourism village layouts. No published study has yet analysed the connectivity of Dinoyo Ceramic *Kampong* using space syntax. This gap is significant because without spatial analysis, efforts to improve the *kampong* may overlook how its labyrinthine layout impacts tourist circulation. Understanding connectivity can inform planners where interventions (like new pathways or signage) are needed to make the area more legible and enjoyable for visitors.

To address this gap, our research employs the Space Syntax method in the context of Dinoyo Ceramic Tourism *Kampong*. Space Syntax provides a set of analytical, quantitative tools (e.g. connectivity, integration, choice, intelligibility measures) to describe how easily people can move through and understand a spatial layout [9]. It goes beyond traditional maps by revealing the underlying graph of connections between spaces and how this affects human behaviour and movement patterns. By using DepthMapX software to perform space syntax analysis, we can graphically model the *kampong*'s street network and calculate connectivity values for each path segment. This approach enables us to identify which areas in the village serve as well-connected hubs of movement and which are isolated dead-ends.

This research aims to explore the connectivity of the Dinoyo Ceramic Tourism *Kampong* through space syntax analysis and to use the findings to formulate strategic recommendations for improving spatial planning and tourist circulation. The study is driven by the urgent need to enhance accessibility and visitor experience in the *kampong*, ensuring its sustainable development as a cultural tourism destination. By explicitly focusing on connectivity, we aim to provide urban planners and local authorities with evidence-based insights, identifying which pathways or intersections are critical for movement, where new connections or improvements are needed, and how the overall spatial structure can be made more legible. In summary, this study fills a research gap by quantitatively evaluating the spatial configuration of an Indonesian tourism village, and it provides practical solutions to bridge the current disconnect between spatial layout and tourism development in Dinoyo.

2. RESEARCH METHOD

This study employs a quantitative approach based on measurable simulations, thereby making it experimental study [10]. Dinoyo Ceramic Tourism *Kampong* was designated as the research object, focusing on understanding the connectivity of spatial configuration using the space syntax method. The research location is in the Dinoyo Ceramic Tourism Village, located on Jalan MT. Haryono No. 9, Dinoyo, Lowokwaru District, Malang City. The boundaries of the Dinoyo Ceramic Tourism Village object in Malang City are as shown in the image below.

Figure 1. Research Location Object Boundaries

The northern boundary is the village on the edge of the Kiduldalem River, while the southern boundary is MT. Haryono Street, the eastern boundary is the Kiduldalem River, and the western boundary is the UNISMA Hospital Building and MT. Haryono Street.There are seven stages of research: 1) Measurement and data collection on the research object, as well as observation of visitors at the location of the object. The data obtained consists of spatial data in the form of CAD or GIS maps of the city of Malang; 2) Spatial Mapping; 3) Segment Division; 4) Data Visualisation using VGA (Visibility Graph Analysis) to visualise the analysis results; 5) Measurement of Connectivity; 6) Data validation with existing conditions; and 7) Research conclusion. Data collection techniques are divided into two categories: primary data and secondary data. Primary data includes documentation and observation of existing conditions. Meanwhile, secondary data includes studies from previous research, scientific journals, and popular writings on the same topic.

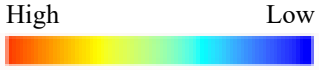

Figure 2. Gradation Colour Parameters in Space Syntax Analysis on Application DepthMapX

This research utilises Space Syntax analysis, aided by DepthMapX software, to examine the connectivity of the object. The analyses available in DepthMapX include Axial Line, Convex Space, Visibility Graph, and Agent Analysis [11]. For this research, Axial Line Analysis was employed to gain a deeper understanding of

the complex spatial structure in Dinoyo Ceramic Tourism *Kampong*. Space syntax analysis has connectivity as an indicator. In DepthMapX, assessment indicators are needed to measure space configuration analysis. It uses the visual area method, with gradient colours indicating parameter values (Figure 2). Dark blue represents the lowest value, while red indicates the highest.

3. RESULTS AND DISCUSSION

The history of the ceramic industry in Malang City began in the 1930s. The artisans started their careers by making crafts from clay (ceramics) and selling them from their own homes. As a result, their community buildings, which also served as homes, also functioned as industrial spaces and ceramic sales shops. Until the 1950s, this area was called "Tanah Agung Dinoyo" [12]. The Dinoyo Ceramic Craft Centre in Malang City is one of the five largest ceramic craft centres in Indonesia. The establishment of the Industrial Company Organising Institution of the Department of Industry (LEPPIN), which then pioneered the emergence of pilot ceramic companies, one of which was established in 1957, namely the Dinoyo Ceramic Factory in Malang City. The Dinoyo Ceramic Factory was a pilot project for ceramic processing, utilising advanced technology of the time, including the casting system (Slip Casting) and rotary press (Jiggering). This factory is a program from the Department of Industry to provide skills training in the production of porcelain materials. Until the late 1960s, there was an increase in the production of ceramic crafts, including cups, mochi, trays, bowls, ashtrays, and electrical equipment (such as insulators), as well as refractory stones and cement. Decorative ceramics are the most sought-after ceramics by consumers and have the highest market demand.

The development of ceramic manufacturing technology began in 1990, with artisans who started to study the firing system using a spiral blender with LPG fuel and conducted a comparative study in Bandung on the concept of ceramic products. In 1998, the Dinoyo Ceramic Craftsmen and Traders Association was established, comprising 33 artisans with a chairman, A. Syamsul Arifin, to preserve the Dinoyo Ceramic Craft Centre's activities as one of the leading products of Malang City's creative economy. This also underlies the formation of the Dinoyo Ceramic Tourism *Kampong* area. In the end, the Dinoyo Ceramic Factory had to close in 2003, so the Community had to take the initiative to open a ceramic business personally or a Home Industry [13]. The Dinoyo Ceramic Craft Centre in Malang City is one of the five largest ceramic craft centres in Indonesia. In 2010, the Dinoyo Ceramic Tourism *Kampong* was officially named by the Malang City Government. The Malang City Government actively organises ceramic festival events that aim to promote the Educational Tourism Village in Malang City. Until 2016, the Dinoyo Ceramic Artisans Association had 31 ceramic members, of whom 16 were engaged in the ceramic industry, nine in the gypsum industry, and seven in industries other than ceramics or gypsum. The following is a list of ceramic industries that are active in the Dinoyo Ceramic Tourism *Kampong*. The following is a list of ceramic industries that are active in the Dinoyo Ceramic Tourism *Kampong*.

Table 1. Ceramic Industry List of Dinoyo Ceramic Tourism *Kampong*

Ceramic Industry			
1.	Amel Ceramics	17.	Lestari Ceramics
2.	Bungsu Jaya Ceramics	18.	Mega Jaya Ceramics
3.	Cinderamata Ceramics	19.	Olif Ceramics
4.	CJDW Ceramics	20.	Ragil Ceramics
5.	CN Ceramics	21.	Rahmad
6.	Denis Ceramics	22.	Rejo Ceramics
7.	Diniku Ceramics	23.	Riati Ceramics
8.	Family Ceramics	24.	Rita Keramik
9.	Firman	25.	SC Ceramics
10.	Gito	26.	Sudirman
11.	Irama Baru Ceramics	27.	Suharto
12.	Ismo	28.	Suyit
13.	Istana Jaya Ceramics	29.	Tanah Agung Ceramics
14.	Kita Ceramics	30.	Ummi Ceramics
15.	Langgeng Ceramics	31.	Yans Ceramics
16.	Larits Ceramics		

Dinoyo Ceramic Tourism *Kampong* offers several activities that reflect the village's identity, carried out by both visitors and community members as actors in the Dinoyo Ceramic Tourism *Kampong*. The actors

in the Dinoyo Ceramic Tourism *Kampong* include visitors/tourists, buyers, resellers, researchers, traders, and ceramic artisans. Tourists do activities looking from one shop to another (buying if there is something suitable), buyers do activities purchase goods for personal use (goods used or consumed personally), there are two types of traders themselves, namely traders with the motivation of buying ceramics and/or gypsum for resale, and traders to sell products where these traders are the people of Dinoyo Ceramic Tourism *Kampong*, ceramic craftsmen, namely the Ceramic Village community who work as ceramic craftsmen carry out ceramic production activities, and researchers conduct observations and conduct field studies (can be in the form of practice/workshops) in Dinoyo Ceramic Tourism *Kampong* [12], [14].

Dinoyo Ceramic Tourism *Kampong* is located in RW 03, Dinoyo Village, Lowokwaru District, Malang City. Dinoyo Ceramic Tourism *Kampong* is known as a village that makes the Ceramic Industry a livelihood for residents, as well as a means of educational tourism for the community. Industrial activities in this Village have existed since 1957. Ceramic products produced from industrial activities in this location have been successfully traded to various places in Indonesia. Dinoyo Ceramic Tourism *Kampong* is situated at an altitude of 480-520 meters above sea level. Dinoyo Ceramic Tourism *Kampong* has a steep or sloping contour on the north side because it is located on the edge of the Brantas River and tends to be sloping on the south side. The northern boundary is the village on the edge of the Kiduldalem River. In contrast, the southern boundary is Jalan Mayjen Maryono, the eastern boundary is Sungai Kiduldalem, and the western boundary is the UNISMA Hospital Building and Jalan Mayjen Haryono.

The land use in the Dinoyo Ceramic Tourism *Kampong* is quite varied, with an area of approximately 10.2 hectares. The dominant land use in this area is housing, occupying an area of 5.6 hectares. The second-largest land use is vacant land, with an area of 2.63 hectares. The emergence of trade and service land use in this area is due to Home Industry activities carried out by the community, requiring them to open their own industrial showrooms in their homes.

Table 2. Land Use of Dinoyo Ceramic Tourism *Kampong*

No.	Land Use	Wide (Ha)	Presentation (%)
1	Housing	4.71	42.86
2	Trade and Services	1.11	10.14
3	Government	0.14	1,.1
4	Education	0.48	4.40
5	Worship	0.07	0.62
6	Health	0.07	0.67
7	Industry	1.45	13.23
8	Empty Land	2.71	24.65
Total		**10.98**	**100**

Dinoyo Ceramic Tourism *Kampong* is dominated by residential land use, which serves not only as a residence, but also as a hub for trade and services. The limited land in this area forces ceramic artisans to sell their work in the showroom of their house. In addition to being a ceramic craftsman village, this village area, which is also close to several campuses in Malang City, has many houses that also serve as boarding houses for students. Public facilities, such as places of worship, health centres, and education institutions, are also available in the Dinoyo Ceramic Tourism *Kampong*, including mosques, elementary schools, and health centres. Public facilities in this area contribute to the rise and pull of movement that occurs here. For example, the location of Dinoyo II Elementary School and Dinoyo Health Centre, which are opposite each other, results in crowds on the Main Road of this Village Area from morning to afternoon.

The Dinoyo Ceramic Tourism *Kampong* features an organic road typology, characterised by a small grid pattern in its residential area. The Dinoyo Ceramic Tourism *Kampong* has 28 environmental roads with a total length of 2.5 km. The road pavement in the Dinoyo Ceramic Tourism *Kampong* consists of six asphalt roads, totalling 787 m in length and 22 roads, including five asphalt roads, 16 paved roads, and one concrete road, with a combined length of 1,713 m. Most of the road widths in the Dinoyo Ceramic Tourism *Kampong* are 1 to 2 meters wide, because this area is a densely populated residential area. The main road in this area, which has asphalt pavement, is 4 to 6 meters wide. This main road serves as an alternative route from Jatimulyo Village to Dinoyo Village for those who prefer not to pass through Jalan Soekarno Hatta. The quality of the road network in the Dinoyo Ceramic Tourism Kampong is quite good; however, the main problem that often occurs on this road section is frequent congestion due to the high volume of vehicles at certain times.

Before conducting space syntax analysis, a base map in .dxf format is required, which is compatible with DepthmapX software. This map was created using ArcGIS (Figure 3).

Figure 3. Map of Dinoyo Ceramic Tourism *Kampong*

3.1. Segment Distribution

Segment distribution is carried out to facilitate the process in space syntax analysis. In the Dinoyo Ceramic Tourism *Kampong,* the distribution of segments resulted in 22 segments corresponding to the road sections in the Dinoyo Ceramic Tourism *Kampong*. The Dinoyo Ceramic Tourism *Kampong* in Malang City, which features distinct physical characteristics along each road, requires researchers to divide each road into separate observation segments. The division of road segments is carried out based on the intersections and the different characteristics of each road. The following is the division of road segments carried out in the Dinoyo Ceramic Tourism *Kampong*.

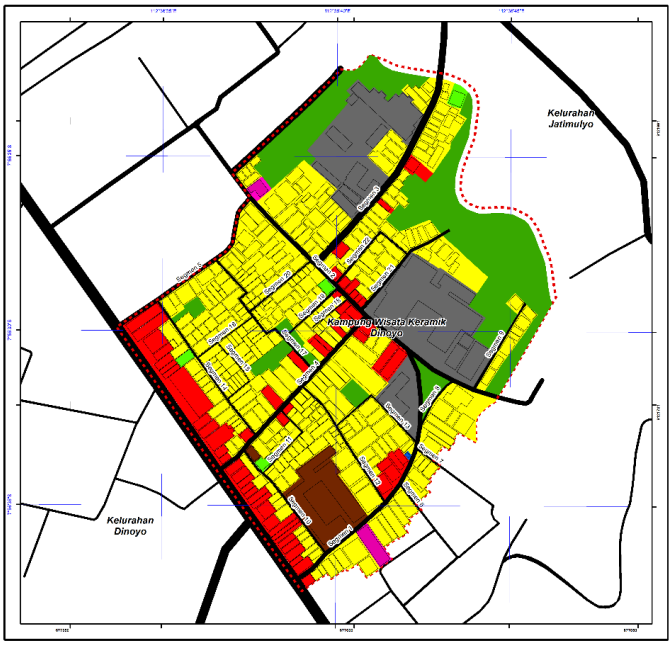

Figure 4. Segment Distribution of Dinoyo Ceramic Tourism *Kampong*

3.2. Space Syntax Analysis

Space Syntax Analysis requires data processing, which involves entering data into ArcGIS software, specifically in the form of road network patterns (Spatial Structure) in Shapefile format. The data is then entered into Q-GIS software, where it is converted into .dxf format, which will later be imported into Depthmap software. Syntax Analysis is a method used to examine the connectivity through the spatial configuration of Dinoyo Ceramic Tourism *Kampong*. The spatial configuration that occurs in this area is analysed using the Visibility Graph Analysis (VGA) technique.

Figure 5. Visibility Graph Analysis (VGA) of Dinoyo Ceramic Tourism *Kampong* Using DepthMapX

Visibility Graph Analysis (VGA) is a tool used to explore the relationship between visibility and permeability of a spatial system. Where the highest value means the position of the space that can see more of the other space. As shown in Figure 5.3, the intersection between segments two and four has the highest visibility value, marked with a warm colour (red). The next highest value is located at the intersection between segments two and three marked in orange.

Table 3. Attribute Summary Visibility Graph Analysis (VGA) of Dinoyo Ceramic Tourism *Kampong*

No	Attribute	Minimum	Average	Maximum
1	Connectivity	5	126.98	336
2	Line Length	0.204436	32.7685	204.825
3	Choice	0	3532.6	256008
4	Entropy	1.61704	2.22304	2.71331
5	Integration	1.48459	3.10937	5.15937
6	Intensity	6.86588	67.327	348.373
7	Harmonic Mean Depth	2.51347	3.64416	6.25973
8	Mean Depth	1337	1337	1337
9	Relativised Entropy	1.69848	2.25386	3.19909
10	RA	0.00226738	0.00396129	0.00787975
11	RRA	0.193822	0.338623	0.673585
12	Total Depth	3358	4868.6	8363
13	Control	0.34554	1	1.95958
14	Controllability	0.0580357	0.358098	0.727273

3.3. Connectivity

Connectivity is an observation variable in space syntax analysis that aims to determine the level of interaction between each space and its surrounding spaces, and to calculate the number of spaces directly connected within a given a space configuration. A high connectivity value indicates that a space is widely connected to other spaces. The higher the connectivity value, the higher the level of interaction between the space and the surrounding spaces. The results of the connectivity analysis are displayed on the map in the form of colours, with warm colours (red) indicating high connectivity values and cool colours (blue) indicating low connectivity values. The following are the results of the connectivity analysis using DepthMapX.

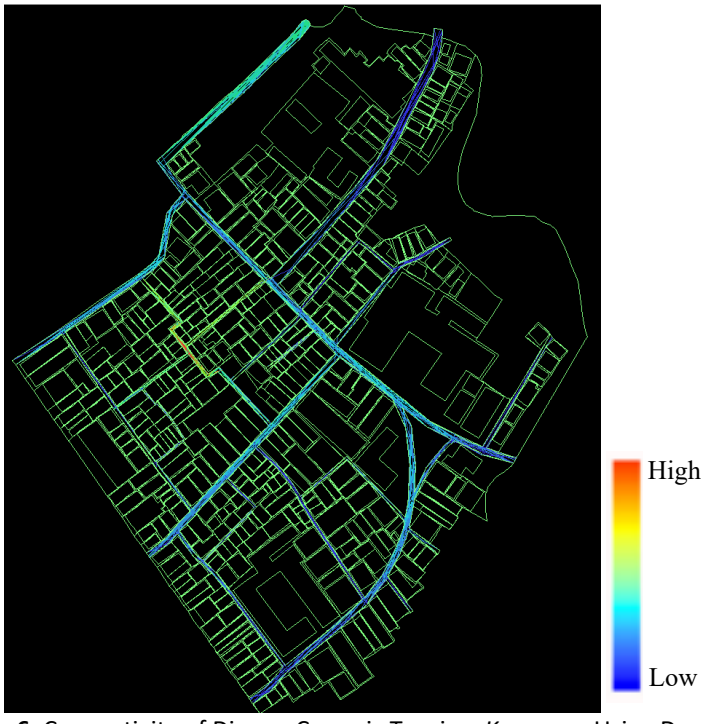

Figure 6. Connectivity of Dinoyo Ceramic Tourism *Kampong* Using DepthMapX

After preparing the spatial model of Dinoyo *kampong*, we conducted a space syntax analysis focusing on connectivity. Using DepthMapX, each road segment (as defined in the methodology) was analysed for its connectivity value, i.e. how many other segments it directly connects to. The results are presented visually in Figure 6 as a colour-coded connectivity map, and quantitatively in Table 3. In the visualisation, warm colours (red, orange) denote segments with higher connectivity values, while cool colours (blue) indicate segments with lower connectivity. From Table 3, the lowest connectivity value found in the *kampong* is 5 (for the least connected segment), and the highest connectivity value is 336 (for the most connected segment), with an average connectivity of approximately 126.98 across all segments. These numbers reflect the number of direct connections (adjacent segments) in the axial graph: a segment with connectivity 5 is a cul-de-sac or end of a chain (connected to only five other segments at its node), whereas one with 336 suggests a central node connecting to many segments (in practice, 336 is relatively high and likely reflects the combined connections in a central location, possibly due to the way DepthMapX counts visual connections in VGA mode). Indeed, Segment 17 emerged as the node with the highest connectivity in the system. Segment 17 corresponds to a central junction in the *kampong*'s road network. At this junction, multiple roads converge or branch off: in the model, Segment 17 is directly linked with segments 2, 4, 5, 16, 19, and 20. This essentially forms a T-intersection or crossroads that ties together different parts of the *kampong*. Notably, one of those connected segments is Jl. M.T. Haryono IX (Segment 20 in the analysis). Thus, Segment 17 functions as a critical hub, funnelling movement between the main external road (MT Haryono IX) and the internal network.

On the connectivity map (Figure 6), Segment 17 is represented in a hot colour (red), confirming its centrality in the layout. Other segments that exhibit high connectivity (orange/red hues) include Segment 20 and Segment 2, which are branches of the main road that penetrate the *kampong*. These highly connected segments likely correspond to the main circulation spine of the village, where several alleys intersect and where a lot of activity (traffic and pedestrians) concentrates. In contrast, segments on the periphery or deep inside branching cul-de-sacs show up in blue, indicating they are poorly connected. For example, any segment with a connectivity of 5 (the minimum) would be an extreme dead-end or a very isolated alley with only one entry point from a parent segment. There are indeed a few such dead-end lanes in Dinoyo, which residents know as quiet corners, but a tourist might not stumble upon unless specifically guided.

3.4. Interpretation and Implications

The connectivity analysis provides several insights into how tourists and locals navigate and perceive the space, and it points to some critical issues and opportunities:

- **Linear vs. Branching Layouts**:
  The results confirm theoretical expectations that linear circulation, which is uninterrupted (or only gently curving), allows people to easily see and reach multiple spaces, thereby increasing their confidence in exploration. In Dinoyo, the linear segments flanked continuously by active frontages (houses/shops) have high interaction values; visitors walking these routes can readily see the next shop or activity ahead, encouraging them to continue onward. Conversely, areas with numerous branching paths and no explicit visual cues (i.e., no open squares or landmarks at regular intervals) can cause confusion for users. Our *kampong* configuration indeed has branches that lead off the main path into tightly-knit residential clusters (often without signage or prominent attractions at the end). According to space syntax theory, such labyrinthine branches reduce intelligibility – users are less able to build a mental map and may hesitate to venture down them. This happens in Dinoyo: tourists, often accompanied by local guides, stick to the main route unless they are not, as the side alleys appear private or unclear. Unexpectedly, we found that even some relatively central alleys had low connectivity due to the way they split off. One might assume that proximity to the centre yields better connectivity, but if the physical connection is a single narrow gate or turn, that segment remains "in the blue." This highlights that not just distance from the centre, but actual connections define spatial experience.

- **Key Nodes (Potential and Problems):**
  Segment 17, the central junction, is clearly a key node for circulation. It is essentially the heart of the *kampong*'s street network. However, field observation indicates that this junction is not currently utilised as a focal point for tourism – it's an unmarked intersection without any particular

amenity (no plaza or prominent signage, just a normal street corner). There's an opportunity to capitalise on this spatial hub: for instance, installing an information map or signage at this junction could orient visitors, since nearly everyone will pass through it. Additionally, high-traffic nodes could be ideal locations for small public spaces or rest areas (if any land is available), where tourists and locals naturally intersect. On the flip side, the analysis identified segments with extremely low connectivity (e.g., dead-end alleys). These are problematic for circulation because they can create bottlenecks or cul-de-sacs where visitors might have to backtrack. One such case is an alley leading to a cluster of ceramic studios at the far northeast. With only one way in and out, the flow is poor, and if multiple visitor groups arrive simultaneously, congestion or confusion can occur. Recognising these as spatial bottlenecks enables planners to consider creating alternative links or loops, thereby reducing the restriction on movement.

- **Land Use Impact on Routes:**
  Since many ceramic showrooms dispersed throughout in the residential fabric, tourists effectively navigate through what is also the locals' private sphere. Land use thus affects which routes are attractive. For instance, the presence of active shops or workshop displays along a path makes it interesting and likely to be traversed. We noted that some low-connectivity alleys still attract tourist foot traffic if a well-known ceramic artisan's studio is located there – people make a deliberate trip down and back out, despite the spatial configuration. Conversely, a well-connected street that is primarily residential with no prominent attractions may be overlooked by tourists. The land use map (Table 2) shows a couple of larger empty land areas; one of these is adjacent to the river, and the other is near the centre. If developed thoughtfully (e.g., transforming an empty plot into a small ceramic art gallery or workshop centre), these could become new attractions and help draw people into less-used parts of the network. Land use planning can thus complement connectivity: placing new amenities or aesthetics features (such as murals or signage) in low-integration areas can draw visitors further, effectively "pulling" them into blue zones, which in turn spreads the circulation load and economic opportunities.

Based on the spatial analysis and observed challenges in the Dinoyo Ceramic Tourism *Kampong*, several practical recommendations can be proposed to address connectivity issues and enhance tourist circulation. One of the most pressing needs is to create alternative linkages that connect currently isolated or poorly accessible areas. These include dead-end segments, often indicated by low connectivity values (blue segments in the space syntax map), which sometimes host tourist attractions such as ceramic workshops. Establishing new pedestrian paths between these disconnected points and nearby streets can significantly improve navigability. Even a simple intervention—such as opening a small gate or developing a narrow alley between two cul-de-sacs—can transform previously segregated routes into more efficient loops. Ideally, any new connections should direct visitors toward primary routes or other points of interest, thereby increasing both spatial clarity and visitor access.

Improving the designation and quality of pedestrian routes is also crucial, especially considering the vehicular congestion along the main *kampong* road. Specific lanes, particularly those traversing the village's central area, should be prioritised as pedestrian paths. These routes could be physically distinguished with unique paving materials, clear directional signage, and lighting enhancements. For example, a walking corridor that parallels the main road—following the route from segments 17 through 5, 4, and 2—could guide tourists through key parts of the village while keeping them safely away from motor vehicle traffic. Enhancing legibility with map installations at major entry points and intersections, such as the junction at Segment 17, would further assist newcomers in navigating the area with greater ease and confidence.

Managing vehicular traffic and improving access to tourism-related facilities are other vital aspects of enhancing connectivity. To reduce conflicts between pedestrians and vehicles, a one-way traffic circulation system could be implemented along the perimeter of the *kampong*, thereby preserving internal pathways for walking and cycling. During peak tourist periods or special events, access to the main internal roads could be limited to residents only. Since the *kampong* currently lacks formal parking infrastructure, allocating a portion of the vacant land near the village entrance for a parking lot would help alleviate congestion. Such a facility would encourage visitors to leave their vehicles outside the dense residential core and complete their visit on foot. Moreover, locating key visitor facilities, such as the ceramic art cooperative centre or future tourist information hubs, on segments with high connectivity would ensure ease of access. If these amenities must

be situated on side streets, additional signage and path improvements should be provided to integrate them seamlessly into the circulation network.

In terms of spatial strategy, the current distribution of ceramic industries across the *kampong* provides both opportunities and challenges. While a dispersed layout helps distribute tourist activity, it also results in some studios being hidden or difficult to find. A partial clustering or zoning approach could enhance visibility and accessibility. By encouraging select showrooms to establish themselves along the main pedestrian loop—perhaps with incentives such as facade improvement grants or signage assistance—even casual visitors would encounter a representative sample of the *kampong*'s ceramic offerings. At the same time, the village's authenticity can be preserved by maintaining production in its original, decentralised form. Organising well-publicised "open studio" events, during which local guides escort visitors through less accessible areas, would also improve connectivity in a temporary yet meaningful way. Providing printed brochures or maps that show the exact locations of each ceramic studio, as listed in Table 1, can further encourage tourists to explore the *kampong* more fully. This not only enhances the visitor experience but also ensures a more equitable distribution of tourism benefits throughout the community.

4. CONCLUSION

This research aimed to analyse and enhance the understanding of connectivity in Dinoyo Ceramic Tourism *Kampong* using space syntax, thereby addressing a gap in spatial analysis for Indonesian tourism villages. The findings clearly demonstrate how the *kampong*'s spatial configuration affects movement and accessibility, thereby impacting the tourist experience. We identified that the village's street network is highly dependent on a few key linear routes (in particular, a central T-junction and main road) for most circulation [15], [16]. These routes exhibit high connectivity and integration, aligning with where most visitors and activities concentrate. In contrast, many smaller alleyways suffer from low connectivity, forming spatial dead-ends that are underutilised and often overlooked by visitors [17]. This fragmented layout corroborates the challenges noted in the *kampong*: narrow roads and complex circulation have indeed resulted in some areas being difficult to access, limiting the distribution of tourist footfall. By explicitly mapping these connectivity patterns, our study addresses the research objective of illuminating the spatial strengths and weaknesses of Dinoyo's layout. The use of space syntax provided quantitative evidence for what was qualitatively suspected – for example, that improving connectivity (through additional links or better route guidance) could significantly enhance overall navigability. Importantly, our results also uncovered a perhaps under-recognised fact: despite its issues, Dinoyo has a strong structural core (the main loop and junction) that, if leveraged properly, can anchor an improved circulation system. In other words, the *kampong*'s layout can be made more legible by building on existing connectivity hubs.

In terms of practical outcomes, the study offers several recommendations for urban planners and local authorities. To enhance tourist circulation and spatial management in Dinoyo Ceramic *Kampong*, planners should consider: (1) Upgrading critical pathways – widen and prioritise the main pedestrian routes, ensure they are safe and clearly marked, and possibly limit vehicle interference on them; (2) Creating new connections – where feasible, add footpaths or small bridges to connect cul-de-sacs and create loops, so visitors have multiple route options and no area remains completely isolated; (3) Improving signage and information – implement a coherent wayfinding system with maps and signs at strategic points (especially at the high connectivity nodes) to guide tourists through the village's attractions, which will mitigate confusion stemming from the organic street pattern; (4) Dedicating space for parking and entry – since external accessibility is vital, provide a proper entry node (like a welcome area or parking lot at the edge) where visitors can transition to walking tours. This reduces random vehicle intrusion and makes the experience more organised from the start; (5) Coordinating land use with circulation – encourage that key tourist-oriented functions (galleries, souvenir shops, cafes) are either located on the more integrated routes or, if off the beaten path, are well-advertised and possibly clustered to create mini-destinations that draw people in. Additionally, manage the timing and flow of local activities (like school traffic) to minimise conflicts with peak tourist times.

Implementing these interventions would address current connectivity challenges and thereby improve tourist circulation. For instance, better-connected and signposted routes mean visitors can comfortably explore the entire *kampong*, potentially spending more time and money at various shops, rather than sticking to just the main road. In turn, this supports more inclusive economic benefits across the community and a more satisfying tourism experience, reinforcing Dinoyo's reputation as an educational and cultural destination.

It is also crucial to note the limitations of our study in applying the findings: the space syntax analysis is a powerful tool, but real-world outcomes will depend on community cooperation, detailed design, and continuous management. We have highlighted that physical connectivity must be paired with improvements in perception (safety, clarity) and infrastructure (path quality, amenities). Moreover, any spatial changes should be sensitive to the *kampong*'s heritage character and residents' daily needs. For example, adding a new footpath might require negotiations if it crosses private land; pedestrianising a street might need consensus from those who use it for vehicle access.

In conclusion, our research contributes a spatial perspective to the development of Dinoyo Ceramic Tourism *Kampong*. The findings directly inform urban design and policy: by identifying where connectivity bottlenecks lie, planners can target those areas for improvement with precision, rather than relying on guesswork. By understanding how land use and spatial configuration interact (e.g., home industries in cul-de-sacs vs. on main streets), local government can craft more effective zoning and tourism strategies. This study underscores that connectivity is not just a technical measure, but a foundation for socio-economic vitality in a tourism *kampong*—when people can physically come together with ease, the cultural and economic exchange that defines a successful tourist destination naturally follows.

Finally, we recommend that future research and implementation efforts build upon our current findings: to test the proposed solutions (perhaps through pilot projects such as a temporary walking trail during a festival) and monitor their impact on tourist movement and local satisfaction. Additionally, expanding the analysis to include visitor behaviour data, community feedback, and integration of other space syntax measures will provide a more holistic understanding. Through iterative improvements and evidence-based planning, Dinoyo Ceramic Tourism *Kampong* can serve as a model for balancing heritage, industry, and tourism in a sustainable spatial framework.

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