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ANALYSIS OF THE LEVEL OF INTEGRATION AND SPATIAL CONNECTIVITY IN THE SPACE CONFIGURATION OF BONGKASA PERTIWI TOURISM VILLAGE BASED ON SPACE SYNTAX

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Abstract

As a quite popular Tourism Village, Bongkasa Pertiwi Village, located in Badung Regency, Bali Province, has experienced many spatial developments within its territory. The development was based on the findings of prior investigations show the phenomenon of spatial transformation of residents' houses both as a place for tourist accommodation and the economy. The spatial transformation that occurs increases the density of buildings and changes the spatial layout of the village area, so that in the future as a tourism village that will continue to grow, To find out, more research is require to measure the optimal level of spatial configuration in terms of inter-spatial connectivity and integrity in village spatial planning. The importance of this research is that the findings can be utilized as guidelines for village spatial design, making it more efficient and improving the quality of interaction between space users (residents and tourists). This study uses a Quantitative - Experimental method based on Space Syntax analysis. The results showed that the average level of connectivity was 2.19407 (highest "5"), integrity 0.286216 (highest "2.11"), and intelligibility at R2: 0.0107275 (best close to "1"), The analysis' findings reveal a limited amount of connection between locations (space / area), so that social interaction that occurs between actors in village spatial planning is also low. These results indicate that the development of interaction center points is very much needed in the current Village Spatial Planning. The development must be based on the highest spatial connectivity-integration points based on space syntax analysis (found 4 area points) in order to obtain optimal results.

Keywords: Tourism Village, Transformation, Spatial Planning, Optimality, Spatial Configuration

1. INTRODUCTION

Tourism is the largest sector that provides income for the province of Bali. The field of Bali tourism can be said to be very developed, if you look at the statistical data of tourist visits to Bali in the last 4 years (2016-2019) it was found that the average increase was 8.60% and after the opening of flights after the Covid-19 pandemic (2022) there was an increase of 4226854.90% because in 2021 there were only 51 foreign tourist visits.

(Central Bureau of Statistics Bali Province, 2023) *The* trend of increasing tourist visits after the pandemic is expected to continue to increase. The tourism sector in Bali is a sector that is able to bring many jobs to the local community, these jobs are in the field of goods and services. Bongkasa Pertiwi Village (BP) certainly enjoys part of the increase in foreign tourist visits.

BP Village is one of the villages designated as a Tourism Village, in Badung Regent Regulation Number 47 of 2010 concerning the Determination of Tourism Village Areas in Badung Regency. In addition, BP Village is also quite popular as a tourist spot. The popularity of BP Village is shown by the embedding of BP Village as (Badung, 2010) *"Tourist Attraction"* on Google search pages. Bongkasa Pertiwi Village even has a rating on Google of 4.4 stars (the highest "5"). Other facts also show the bustle of tourism news in Bongkasa Pertiwi Village on the Google search engine platform. The increase in popularity of the village with its tourism activities through existing tourist attractions also encourages the emergence of tourism services in the surrounding area. This visible phenomenon can have an influence on the development of the surrounding built environment, which includes local community residential areas as residential areas supporting tourism (Widhijanto & Tisnaningtyas, 2018).

The phenomenon of the popularity of BP Village has led to spatial transformation. Based on the results of previous studies, it is known that in the BP Village Settlements there is a house complex that has an additional function as Tourism Accommodation (Prabawa & Nurwarsih, 2022). The Tourism Accommodation in question is conventional and community-based tourist accommodation (AWBM) with a typology of Homestay / Guesthouse / Villa buildings. Tourism Accommodation in the form of AWBM there are a total of 10 Areas / Locations spread across the Banjar Tegal Kuning, Banjar Karang Dalem I, and Banjar Karang Dalem II areas. In addition to the transformation of the spatial layout of the house as a container of tourist accommodation functions, there is also a transformation of the spatial layout of the house as a container of economic activities such as shops, stalls, restaurants, offices, etc. The forms of spatial transformation that occur cause an increase in building mass, so that in the village layout some areas become densely built.

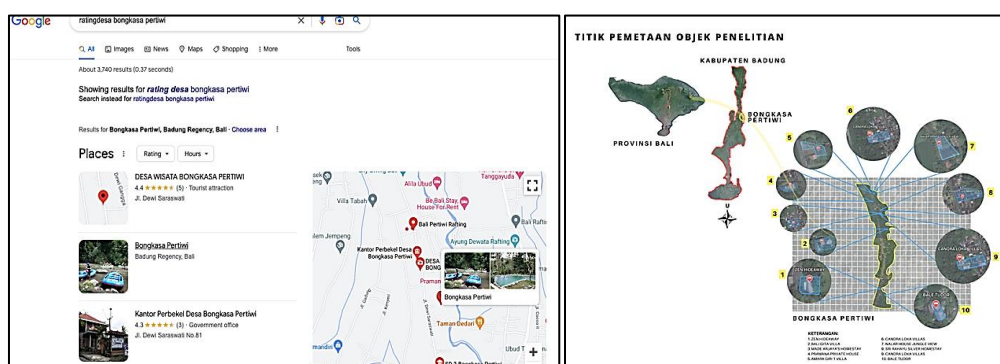


Figure 1. The Popularity of Bongkasa Pertiwi Tourism Village and the Distribution of Tourist Accommodation in Residents' Homes
Source: Google Image Search, 2021

In the future, Bongkasa Pertiwi Village as a village that is already known for its tourism, and already has a title as a Tourism Village according to Perbup, will need to know the characteristics of the current (existing) Village Typical Space Configuration. This spatial configuration is related to the connectedness and integration between spaces.

With the knowledge of spatial configurations related to connectivity and integration, in the future BP Village will be able to formulate optimal and efficient development as a tourist destination as well as optimal residential areas. The formulation of the development can certainly be done by first carrying out a spatial configuration study to look for the current spatial configuration characteristics of Bongkasa Pertiwi Village, the findings are analyzed and aligned to find what kind of spatial configuration characteristics and what Development Recommendations in the future can be proposed to the Village as Design Guidelines for improving the quality of Village Spatial Planning. The urgency of this study is to find the characteristics of Village Tourism Space Configuration in terms of spatial organization within the Bongkasa Pertiwi Village area based on space syntax. Finding the characteristics of the spatial configuration of Bongkasa Pertiwi Village, which in the future can be a reference for the development of village space (design guidelines), especially related to village tourism.

2. LITERATURE REVIEW

2.1 Room Configuration

Village spatial configuration is the process of planning and spatial arrangement related to the management of natural resources, infrastructure and services available in the village. This process involves physical village regulation, territorial regulation, natural resource regulation, infrastructure arrangement, spatial arrangement, social and economic service arrangement, and village regulation. The purpose of village space configuration is to ensure that the village can utilize the natural resources, infrastructure and services available effectively and efficiently. Efficient spatial configuration is closely related to the aspect of Connectivity. Connectivity can be understood as a parameter in measuring the level of spaces that are directly related in a spatial configuration (Sarma, 2006) . Connectivity is also used to measure how much circulation / paths / roads are interconnected so that it leads to the finding of the magnitude of the level of spatial interaction in terms of access connectivity parameters. The level of connectivity of a spatial configuration is very important to measure the level of integration. If in the observation found many rooms that are interconnected with the room that is the object of observation, it can also be concluded that the level of integration is also good. The high level of connectivity and integration in Space Syntax theory can be understood as a composition of space that has high accessibility because it is easy to reach from various points / areas (Ramadan et al., 2018) . The high level of accessibility is then an indicator in finding the most suitable titik / area for the construction of infrastructure and social / public facilities, because it is classified as an area that has high circulation attractiveness. In ensuring the level of accessibility of a room in more detail, you can use Intelligibility analysis. Intelligibility is the final stage in measuring the degree of space integration in space syntax theory. The level of the results of the intelligence analysis shows the level of relationship between the value of local scale measurement (connectivity) and the value of global scale measurement (integrity). So, it is understandable that intelligibility is a measurement of a spatial configuration structure. Unlike connectivity and integrity, the results of intelligibility measurements will be a component of the spatial configuration system (comprehensive), while the results of connectivity and integrity measurements will be measurements on aspects of microcirculation and spatial connectedness in a spatial configuration composition.

2.2 Space Syntax

To find the characteristics of the most optimal spatial configuration related to space organization, movement patterns, and the meaning of space (function) requires a deep understanding of Space Syntax. Space syntax is a theory of space concerned with a set of analytical tools, which are both quantitative and descriptive to analyze spatial formations in different forms: buildings, cities, interior spaces or landscapes. The main purpose of (Sarma, 2006) Space syntax is to find the relationship between humans and the space in which they live. It is believed that special characteristics of man exist in spatial systems and their information is transmitted through space itself and spatial organization. (Dursun, 2007) . Space syntax calls the relational nature of that spatial configuration, and states that those properties shape human behavior to contain social information. The goal of space syntax research is to develop descriptive strategies for configuring inhabited spaces so that underlying social meanings can be realized. This, in turn, may allow the development of secondary theories, or often practical explanations, of the influence of spatial configurations on various social or cultural variables. The subject of space syntax research is an understanding of configured space itself, specifically its formation process and social meaning. (Bafna, 2016) . Space syntax theory can also be used as a research instrument to understand space with depth measurement at the level of organizing space, movement patterns in space, and even knowing the social meaning of a spatial composition. Basically, the design of a space produced is not static, but has a life that can be felt by its users. This basic thing is the reason for the analysis of space configuration, and the most appropriate instrument is to use Space syntax. Space syntax analysis can be done with the help of the DepthMapX application, this application was developed to facilitate the analysis of the movement of individual's / space users in a composition of space configurations.

3. RESEARCH METHODS

The method used in this study is quantitative based on measurable simulation, so this research is experimental (Groat & Wang, 2013). The Bongkasa Pertiwi Village area is designated as a case study in this study to examine the optimality of connectivity and integration in village spatial planning based on spatial configuration tests. This experimental study-based research is carried out with the help of simulations, researchers propose plans by going through simulation studies and trying problem-solving planning models (Prasasti Barada & Mutiari, 2013). This simulation study uses existing data in case studies. Intervention is carried out only on the boundaries of the area of the case studied and then simulated. Research with quantitative-experimental methods is carried out in stages: 1) Survey & Simulation; 2) Data Tabulation; 3) Simulation-Based Analysis; 4) Research Conclusions. The research carried out is included in quantitative grounded research. The grounded research analysis method is the zigzag process (Lewis, 2015). The zigzag process is the process of going to the field to make observations / interviews / research on a computer, then returning to the workspace for data analysis, then returning to the field to carry out the same process and returning to the workspace, this process continues until the most appropriate and complete data is found to answer the research question. Space Syntax is a way to analyze the relationship between spatial configuration and humans as users of space, both on a small scale and in urban areas. Space Syntax deals with relationships between spatial configurations and people in a measurable way, using graphical and mathematical languages. (Lesmana, 2022) Space Syntax uses graphs to model the way spaces relate to each other in multiple graphs. As a method of measured

analysis, Space Syntax uses some mathematical actions in its application. In this study, axial line analysis will be used to find the value of the level of connectivity, integration, and intelligibility between existing spaces.

4. FINDINGS AND DISCUSSION

In finding the characteristics of the spatial configuration of Bongkasa Pertiwi Village, an Axial Map analysis was carried out through the DepthmapX software. The variables analyzed are the axials of roads in the area of Bongkasa Pertiwi Village. The streets in question are like Main Road, Neighborhood Road, and Footpath. The results of this axial analysis show that there are several points that have high / low connectivity which can further provide an overview of central location points and those that are not connected at all.

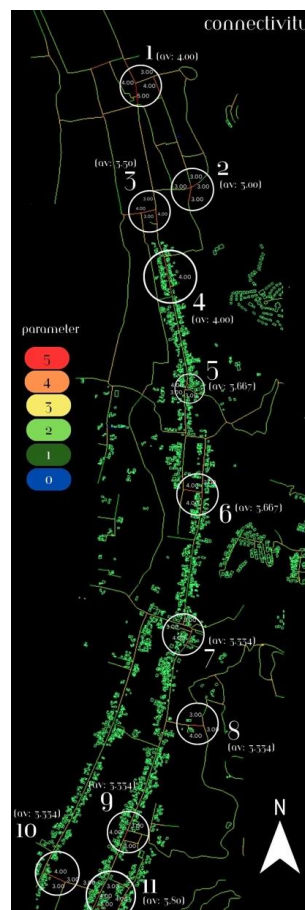


Figure 2. Analysis Results (*Connection Attributes*)
Source: Researcher, 2023

Table 1. Tabulation of Level Analysis Results *Connectivity* (Top Score)

AREA	1	2	3	4	5	6	7	8	9	10	11
	3,00	3,00	3,00	4,00	4,00	3,00	3,00	3,00	3,00	4,00	3,00
	4,00	3,00	4,00		3,00	4,00	3,00	3,00	4,00	3,00	3,00
	4,00	3,00	4,00		3,00	4,00	4,00	4,00	3,00	3,00	4,00
	5,00	3,00	3,00								4,00
											5,00
Average	4,00	3,00	3,50	4,00	3,33	3,67	3,33	3,33	3,33	3,33	3,80

Source: Researcher, 2023

Based on the results of axial map analysis, 11 points / areas were found in the Bongkasa Pertiwi Tourism Village area that have a high level of connectivity / connectivity in terms of circulation access, so that these 11 points / areas can be referred to as central locations. 11 This central location with high connectivity value is characterized by a crossroads area (T-junction / intersection). Overall, there are only 1-2 axial lines that are blue (value 0), so it can be concluded that the entire circulation access in the area of Bongkasa Pertiwi Village has been interconnected even though it is still dominant on the green line (value 2) which is formed outside the circulation intersection (road). The point or area with the highest connectivity, which has an average of 4, is at the points of areas 1 and 4. Based on the results of connectivity analysis, it is known that the value of overall circulation access connectivity if averaged at 2.19407 is still in the range of 2-3, so that connectivity between spaces in Bongkasa Pertiwi Village is included in low-medium connectivity. This low-medium connectivity characteristic shows that the Spatial Configuration of Bongkasa Pertiwi Village has a rare level of spatial relations, so that the mobility of residents who encourage the occurrence of a wide scope of social interaction between villagers within the area tends to be difficult.

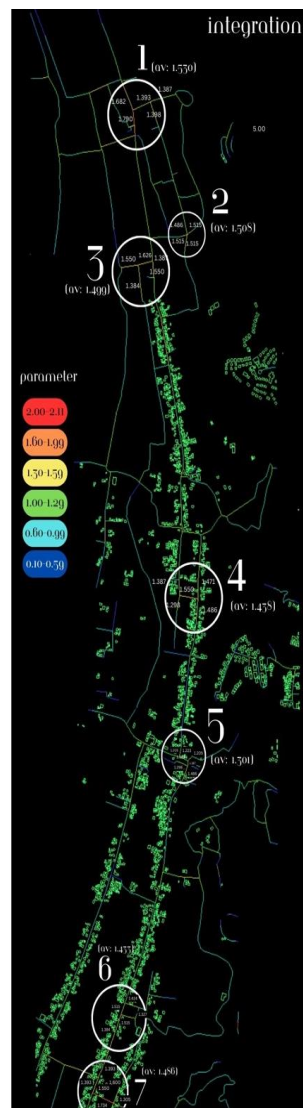


Figure 3. Analysis Results (*Integration Attributes*)
Source: Researcher, 2023

Table 2. Tabulation of Integration Analysis Results (Highest Value)

AREA	1	2	3	4	5	6	7
	1.682	1.486	1.550	1.387	1.205	1.424	1.393
	1.790	1.515	1.626	1.298	1.223	1.515	1.393
	1.393	1.515	1.387	1.550	1.305	1.515	1.550
	1.398	1.515	1.550	1.471	1.205	1.327	1.600
	1.387		1.384	1.486	1.387	1.384	1.734
					1.298		1.305
					1.486		1.424
Average	1.530	1.508	1.499	1.438	1.301	1.433	1.486

Source: Researcher, 2023

Based on the results of axial map integration analysis, 7 points were found to have a fairly high level of integration between spaces. The level of permeability and accessibility is included in the low group with an average value of 0.286216. The integration analysis shows the complexity of physical spaces formed in the area of Bongkasa Pertiwi Village. The complexity of the space formed shows the 7 highest integration points which can then be identified as the 7 best integration center points in the village area. These points are areas that are very suitable for the function of the Community Activity Center because high spatial integration points are able to produce a good level of social interaction. This good level of social interaction is assessed from the level of integration and connectivity related to increasing the efficiency of the movement of space users (village communities).

Table 3. Summary of DepthmapX (Integration & Connectivity) Analysis Results

No	Attributes	Minimum	Average	Maximum
1	Connectivity	0	2,19407	5
2	Integration [HH] / Global Integration	0,103414	0,286216	2,11196

Source: Researcher, 2023

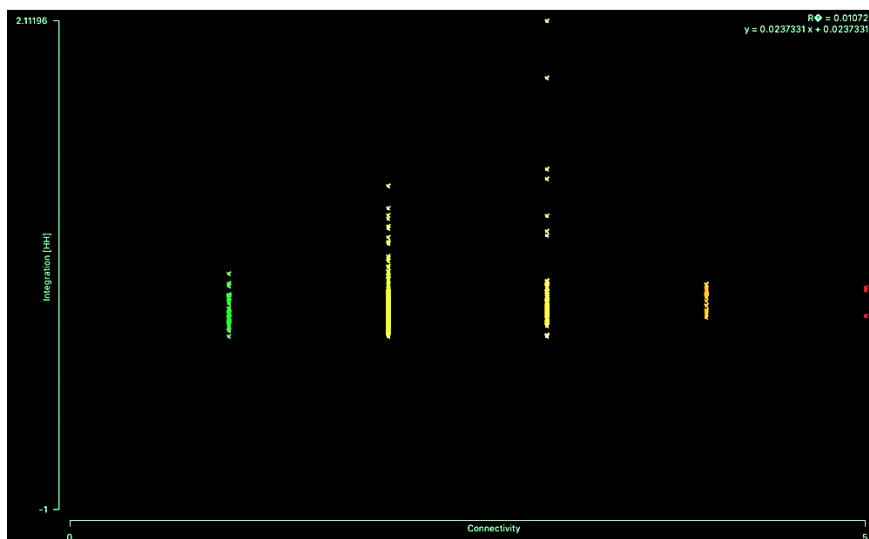



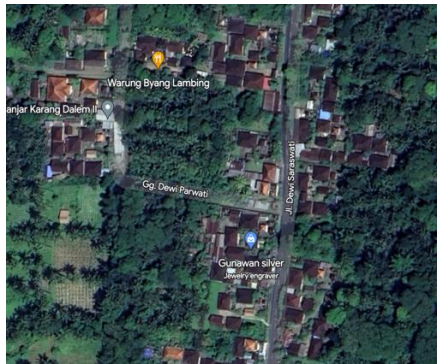
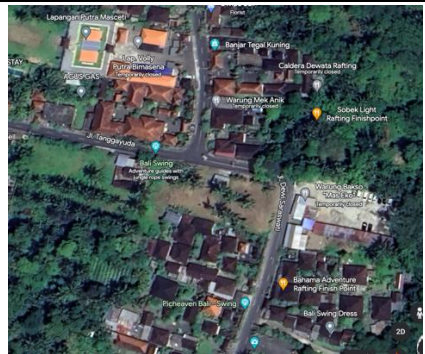
Figure 4. Analysis Results *Intelligibility*


Source: Researcher, 2023

The findings in connectivity and integrity analysis are then analyzed again in the final stage of intelligibility analysis. intelligibility analysis (clarity value) is an analysis of the relationship between the level of connectivity and the level of spatial integrity. A space will be easier to recognize if it has a relationship between the two variables that are also strong (Setyaningrum et al., 2022). In the results of processing using Space Syntax

(Connectivity & Integrity), it can be seen that the spatial pattern of Bongkasa Pertiwi Village forms a linear pattern with a network of roads and spaces that are already interconnected but at a low-medium level. The level of intelligibility is determined by the magnitude of the correlation value (R2) which indicates the level of reliability of the resulting regression model. By compiling the connectivity diagram as variable x and integration as variable y in the Depthmapx application, we found the correlation value R2: 0.0107275. The magnitude indicates a very low correlation level because it is very far from the value of "1" / "0.5". High integrity values cause spaces in the regional structure to tend to be easily accessible (natural movement theory) (Hillier, 2007). Based on the correlation value and theory, it can be concluded that the level of ease of individuals (village communities) in understanding the structure of building space is very low. The level of understanding also affects the level of ease of access / mobility of the community to move within the village area which is also very low.

Table 4. Area Point with the Highest Connectivity and Integration Value (same point)

No	Road (Circulation)	Area Point Ultimate Connectivity	Highest Integration Area Point	Image/Photo
1	<p>Crossroads of Jalan Dewi Saraswati (Utama) with Jalan Dewi Sri</p> <p>The location is in the neighborhood of Br. Karang Dalem I</p> <p>Average Connectivity Level: 3.50</p> <p>Average Integrity Level: 1.499</p>	3	3	
2	<p>Crossroads of Jalan Dewi Saraswati (Main) with Gang Dewi Parvati. Bale Banjar Karang Dalem II nearby</p> <p>The location is in the neighborhood of Br. Karang Dalem II</p> <p>Average Connectivity Level: 3,667</p> <p>Average Integrity Level: 1.438</p>	6	4	
3	<p>Crossroads of Jalan Dewi Saraswati (Main) with Jalan Tanga Yudha</p> <p>The location is in the neighborhood of Br. Tegal Kuning</p> <p>Average Connectivity Level: 3,334</p> <p>Average Integrity Level: 1.438</p>	7	5	

No	Road (Circulation)	Area Point Ultimate Connectivity	Highest Integration Area Point	Image/Photo
4	<p>Jalan Tangga Yudha area in the "Olas Asih" Multipurpose Cooperative area</p> <p>The location is in the neighborhood of Br. Tegal Kuning</p> <p>Average Connectivity Level: 3,334</p> <p>Average Integrity Level: 1.433</p>	9	6	

Source: Researcher, 2023

Based on the results of connectivity and integration analysis that has been carried out, it was found that there are several highest area points in each category that have the same point / area position (table 4). The point of the area can then be understood as the most suitable area point to be placed any building / facility that functions publicly that is able to increase social interaction between space users (residents / tourists / tourism actors) within the BP Tourism Village area.

5. CONCLUSION

Based on the results of the overall analysis previously described, the spatial configuration characteristics of BP Tourism Village have a low level of Connectivity (Average Value: 2.19407) and Integrity (Average Value: 0.286216). So it can be concluded that the level of spatial connectedness and interintegration of space in the village area is also very low. The Hasl is reinforced by the results of Intelligibility analysis (R2 value: 0.0107275). The very low level of intelligibility causes social interaction between village communities within the scope of the Bongkasa Pertiwi Tourism Village area to also be low. Looking also from the axial analysis in depthmapX, Bongkasa Pertiwi Village has a linear circulation pattern and a very vertical geographical shape, and the spaces formed follow this circulation pattern so that they tend to be far apart between banjar areas (groups / settlement centers). Based on the pattern of circulation, the geographical shape of the area, it strengthens why the level of social interaction is low, because the distance between the points of integration / connectivity of settlements is high enough far apart. However, behind these findings, there are several points of area that in connectivity and integrity analysis both have the highest value, namely Point 1 (Intersection of Jl. Dewi Saraswati-Jl. Dewi); Point 2 (Jl. Dewi Saraswati-Gg Dewi Parwati Area Br. Karang Dalem II); Point 3 (Intersection Jl. Dewi Saraswati-Jl. Yudha's Ladder); and Point 4 (Jl. Tangga Yudha area near KSU "Olas Asih"). These 4 points in the future are very suitable to build a public / tourism facility that can increase the level of mobilization of tourists/villagers to increase the level of social interaction within the Bongkasa Pertiwi Tourism Village area.

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