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SPATIAL ANALYSIS IN CONSERVATION SITU IN BANTEN PROVINCE: CASE STUDY OF SITU KADUPAYUNG, PANDEGLANG REGENCY, BANTEN

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ABSTRACT

Spatial planning analysis is a way to identify the location and area of a site based on spatial structure and spatial patterns. The research aims to discuss Spatial Analysis of Site Conservation in Banten Province: Case Study of Situ Kadupayung, Pandeglang Regency, Banten. The research method uses survey methods and uses Geographic Information System (GIS) analysis, as well as site area and contour analysis methods. The research results show that the area based on the KIB in Situ Kadupayung is 40,000 m². From the results of GPS RTK measurefments, it is known that the area of Situ Kadupayung is 34,462 m2 / 3.44 Ha. The difference between the measurement results and the goods inventory card (KIB) data at Situ Kadupayung is -5.538 m² / -0.55 Ha. There are 2 (two) factors that can cause large differences between Goods Inventory Card (KIB) data, namely 1) Internal Factors: Measurement techniques used (methods and tools); Errors in inputting measurement results data; 2) External Factors: Natural Factors, namely sedimentation, and Non-Natural Factors (Society).

Keywords: *Spatial Analysis; Conservation Situ; Banten Province.*

1. Introduction

Global urbanization has not only promoted social and economic development but also contributed to serious ecological challenges. Recent global environmental changes indicate that our planet has entered the Anthropocene, and human activities have become a major factor in changing the surface landscape. As priority conservation areas for maintaining biodiversity and ecosystem service supply, ecological sources are key ecological security pattern components to be identified first. The spatial pattern of ecological sources will influence the subsequent corridor extraction and network construction [1].

The land is one of the Regional Properties (BMD) which is vulnerable to legal problems because it has high economic value. Both central and regional governments must make efforts to secure BMD assets both administratively and legally. BMD in the form of land must be certified in the name of the Regional Government that controls and/or uses the land in question in accordance with the provisions of the applicable Law. Situ or other names according to the area is a container of puddles of water on the surface of the land that forms naturally or artificially and is a source of raw water whose water comes from the ground, rainwater, and/or other water sources. There are 137 sites spread throughout the Banten region, recorded as assets in the Goods Inventory Card (KIB) of the Regional Financial and Asset Management Agency (BPKAD) of Banten Province. Goods Inventory Card (KIB) is a card where inventory items are recorded individually or in groups/collectively, complete with data on origin, volume, capacity, brand, type, value/price and other data regarding the goods, which are required for inventory or other purposes and is used as long as the item has not been removed. One of the goods inventory cards consists of the Land Inventory Card (KIB A), which is

Vol. 4, No.2, p.140-148, 2023
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Received: 17-10-2023 |
Publish: 27-10-2023 |

used to record any land owned by the regional government [2]. Most of these sites were a transfer of assets from West Java Province after Banten Province was established, plus inventory results from other agencies. As one of the potential reservoirs of water resources, Situ has an important role in efforts to utilize and conserve water resources [3].

Considering the importance of securing regional property assets (BMD) in Banten Province, it is important for Situ Kadupayung to be ratified in order to provide legal certainty or legality; provide legal protection to land rights holders; carry out orderly administration; and secure Banten Province BMD assets. This effort is also an effort to save and preserve lakes in the Banten region.

Situ/swamp as part of the watershed system (river watershed) has an important function, both as a reservoir for useful water flood control, water resource conservation (groundwater suppliers), local economic development, and recreational areas. For flood prevention, lakes have an important role as water parking areas (retarding basins) to reduce the amount of water runoff / water retention. Maintaining the quality of the area and depth of the lake is an inseparable part of flood management activities. Based on PUPR Ministerial Decree no 28/PRT/M/2015 concerning Determination of River Boundary Lines and Lake Boundary Lines. That a lake is a part of a river whose width and depth naturally far exceed other sections of the river in question. In relation to the definition of situ, it is specifically stated that lake is classified as a surface water source, which is a term in Sundanese which means natural lake or artificial but its size is relatively small compared to the lake.

Spatial planning analysis is a way to identify the location and area of a site based on spatial structure and spatial patterns. In general, in the spatial structure the location will be listed as other network infrastructure as a water resource and in the spatial pattern it will be mapped as a lake/situ area or a protected area in the form of local protection. Spatial pattern analysis through a location identification process, where in a given space there are water resources (lakes) or protected areas in the form of local protection.

There are several previous studies that also examined spatial analysis, including: first, Spatial analysis of endemism to redefine conservation areas in Western Ghats (India) [4], second, Spatial analysis and heritage conservation: Leveraging 3-D data and GIS for monitoring earthen architecture [5], third, Analysis of spatial heterogeneity and driving factors of capital allocation efficiency in energy conservation and environmental protection industry under environmental regulation [6]. Forth, Spatial Configuration of the Surabaya City Heroes Monument Public Space [7]. fifth, Analysis of Spatial Patterns of Landslide Distribution to Determine the Main Controlling Factors of Landslides in the Kodil Watershed, Central Java Province [8]. Sixth, Applied risk mapping and spatial analysis of address-level decedent data to inform opioid overdose interventions: The Massachusetts HEALing Communities Study [9]. Seventh, Spatial modeling and analysis based on spatial information of the ship encounters for intelligent navigation safety [10]. Among the previous research studies that discussed about situ: first, research on the analysis of the factors that caused the Gintung embankment to break [11] second, research discussing the abundance of macrozoobenthos in the waters of the Pamulang pond [12]. third, a study of the water quality of the Gintung pond, East Ciputat District, South Tangerang City [13].Based on the literature review, there has been no research that discusses the spatial analysis of a site, especially a site located in the Pandeglang Banten area.

2. Material and Methods

At the data collection stage, researchers will explore the study area by means of field observations to gain a sense of the conditions of the Situ Area. Researchers write and note down anything they feel is relevant in understanding the study area more deeply. Researchers conducted many interviews and discussions with stakeholders to obtain their aspirations about the conditions of the study area. This data collection can be in the form of primary or secondary data.

Geographic Information System (GIS)/Geographic Information System (GIS) is a computer-based information system, which is used to process georeferenced spatial data (in the form of details, facts, conditions, etc.) stored in a database and related to real world problems and conditions. The general benefits of GIS are providing information that is close to real world conditions, predicting results and strategic planning [14] To manage geographic information, GIS has several processes,

Vol. 4, No.2, p.140-148, 2023
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one of which is data input. All geographic data is first converted into digital data that can be recognized by computers. Basically, there are 2 types of geographic data, spatial data and attribute data: 1) Location data (spatial), spatial data is represented in two formats, namely raster data and vector data. 2) Descriptive Data (attributes). This research uses a survey method. To obtain the existing land area at this time, several analysis techniques must be used, including: 1). Spatial data analysis Spatial data can be generated from various sources, including: satellite images, analog maps, aerial photos, tabular data and survey data. To depict objects or features of the earth's surface on a computer screen, we need a depiction system that represents the actual state of the earth, which we call a projection. Our projections are described in a Cartesian coordinate system, which we generally known in terms of X and Y units.

2.1. Geographic Information System (GIS) Methods

GIS (Geographic Information System) or geographic information system is a computer-based tool for mapping and analyzing existing things and events that occur on earth [15]. Geographic Information Systems (GIS) in general are special information systems that manage data that has spatial information. GIS is also a type of software that can be used to enter, store, manipulate, display and output geographic information and its attributes. Geographic Information System technology can be used for scientific investigations, resource management, development planning, cartography and route planning. Geographic Information Systems are divided into two groups, namely manual (analog) systems and automatic (digital computer-based) systems. Geographic Information Systems (GIS) can function as an integrated data bank, that is, they can guide spatial and non-spatial data in an integrated database. Nowadays, GIS, with its extensive capabilities in storing, retrieving, processing, and analyzing spatial information along with documentary data, has been able to address these problems and complexities effectively [16].

2.2. Situ Area and Contour Analysis Method

Contour analysis divides the field estimates into contours and then calculates the average position of each contour: it is shown that this method avoids the smearing and weakening of important dynamical features which can result from the traditional method of simply averaging data values at fixed geographical coordinates [17]. There are several ways that can be used to identify the size of the site in Pandeglang Regency, namely: 1) Carrying out analysis using Arcgis software by utilizing the spatial pattern map of Pandeglang Regency. 2) Identify by tracking using GPS around the sites in the Regency. Pandeglang, then the results of the GPS tracking are exported into global mapper/ mapsourse/ dnr/ basecamp or other software to convert it into a shape file so that after that it is analyzed using Arcgis sortware 3) Carrying out identification using aerial photos using a drone at each site to obtain conditions existing, then after that carry out control points at each site. After that, each site underwent a georeferencing process using Arcgis software so that it could be digitized and analyzed the area of the site. 4) Topographic measurements to see the existing contours using a theodolite to determine the height difference of the existing contours in the field. Which will later be processed into a contour map.

3. Result and Discussion

Pandeglang Regency is one of the regencies located in western part of Banten Province. The area of Pandeglang Regency itself is 274,689.91 Ha or 2,747 Km^2 or 29.98 percent of the area of Banten Province and makes Pandeglang Regency the second largest Regency in Banten Province after Lebak Regency. With this area, Pandeglang Regency is not the only residential area that exists there, but Pandeglang Regency has protected forests, production forests, fields, plantations and other public facilities.

JICE Journal Innovation of Civil Engineering
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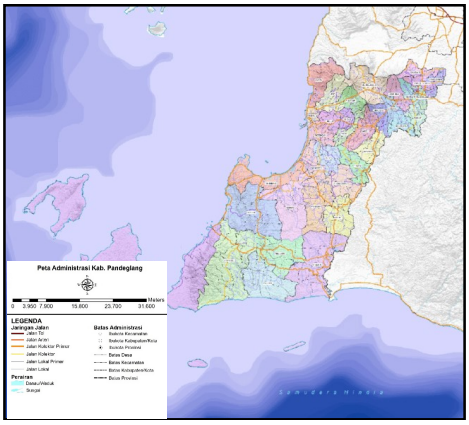

Figure 1. Pandeglang Regency Administrative Boundary Map
Source: Pandeglang Regency Spatial Planning Plan 2011-2031

Situ Kadupayung is geographically located at 6°22'2.73"S latitude South and 105°55'2.27"E East Longitude and administratively located in Kadupayung Village, Menes District, Pandeglang Regency. As time progresses, changes in land use which undergo a transition followed by a reduction in types of land use will affect the physical condition of an area. This is in line with increasing demographics in an area which will have an impact on land needs. Based on the results of field observations and interviews with the local community, especially elder figures, which were carried out in a preliminary survey. Some information was obtained regarding the conditions and characteristics of the site, as follows.

Kadupayung is an artificial lake, before 1998 it was an area for kirai plants. In 1999/2000, excavations were carried out by the Main River Basin Development Project (PIPWS), thus forming a flood area. In 2012, dredging was carried out again and construction was carried out in the area, starting from the construction of retaining walls and spillway buildings and outlet buildings. Utilization of lake water includes irrigating food agriculture and fisheries areas, especially in Kadupayung Village, Muruy Village, Purwaraja Village; and as a source of water reserves for the community, especially the settlements in the vicinity. The source of the water here comes from original springs and irrigation of rice fields around there, and flows out into the Naherang River and the Cibabat River. The river is included in the Ciliman - Cibungur River Basin Unit (SWS). The water level is only up to the maximum embankment limit of ± 3 meters. There are 8 inlets, but only 6 inlets are active. There is 1 outlet and 1 spillway building. Land use in the area includes residential buildings, mixed gardens and food farming areas.

Figure 2. Existing Condition of Situ Kadupayung
Source: Consultant Survey Results, 2023

JICE Journal Innovation of Civil Engineering
Vol. 4, No.2, p.140-148, 2023
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Accessibility to Situ Kadupayung is supported by the availability of a road network, starting from external and internal roads to the site. The mode of transportation that can be used from Pandeglang to Menes is the Pandeglang – Labuan bus route, then from Menes to Situ Kadupayung there is no public transportation.

3.1 Air Mapping Results

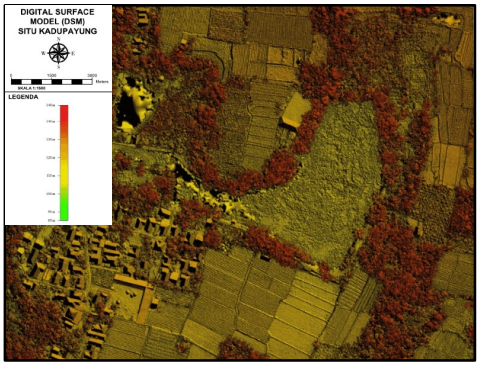

Figure 3. Digital Surface Model (DSM) Situ Kadupayung
Source: Consultant Survey Results, 2023

The concept of Digital Photogrammetry processing is to use a mathematical formula to transform 2D photos into 3D geometry. At least two photos are needed so that the 3D geometry of the object can be calculated using the perspective projection transformation formula. In summary, the mapping product processing process is as follows: UAV Data Contour → DSM (Digital Surface Model) → DTM (Digital Terrain Model) → Contour/Topography.

3.2 Situ Wide Indication Analysis

The results of measurements carried out at Situ Kadupayung have differences with the extensive data listed in the Goods Inventory Card (KIB). The area of Situ Kadupayung measured as a result is 34,462 m², while based on KIB data the area of Situ Kadupayung is 40,000 m². The aim of the area indication analysis is to find out the cause of the difference in area. There are several analyzes used in this method, including Spatial Analysis (location and area of the site based on Regional Spatial Plan documents), Topographic Modeling (finding out indications of the area of the site based on the contour/topography of the site) Situ Border Modeling (buffering the site border area according to provisions regulation).

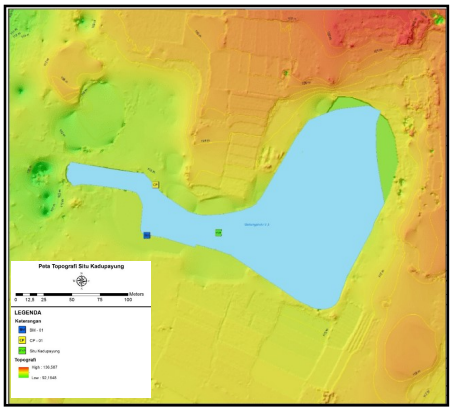

Figure 4. Topographic Map of Kadupayung Situ
Source: Consultant Survey Results, 2023

JICE Journal Innovation of Civil Engineering

Vol. 4, No.2, p.140-148, 2023
Send: 20-09-2023 |
Received: 17-10-2023 |
Publish: 27-10-2023 |

3.3 Spatial Analysis

Spatial analysis is one way to identify the location and area of a site based on spatial structure and spatial patterns. In general, in the spatial structure the location will be listed as other network infrastructure as an air resource and in the spatial pattern it will be mapped as a lake/situ area or a protected area in the form of local protection. Spatial pattern analysis through a location identification process, where in a given space there is an air resource (lake) or a protected area in the form of local protection. The method used in this process is by overlaying the location with a spatial pattern plan map for the Pandeglang Regency area. The input used is Pandeglang Regency Regional Regulation Number 2 of 2020 concerning Amendments to Pandeglang Regency Regional Regulation Number 3 of 2011 concerning the Pandeglang Regency Spatial Plan for 2011-2031. For more details, the results of the spatial pattern analysis can be seen in Table below.

Table 1. The Results of Overlays analysis between the Situ Location and the Spatial Pattern

Situ Name	Slice on The Map	Location to Spatial Patterns
Situ Kadupayung		Based on overlay analysis between spatial plan and situ location, the Situ is located in the horticulture area

Special provisions are provisions that regulate zone use which has a special function and is enforced according to the characteristics of the zone and its activities. Apart from that, provisions on zones depicted on a separate map that have overlays with other zones can also be explained in this special provision. Special provisions are additional rules that are overlaid on top of a particular zone/subzone because there are special matters that require separate rules. Provisions regarding the application of special rules in the special zones above are determined in accordance with the provisions issued by the competent authority.

3.4 Tabulation of Analysis Results

Tabulation of analysis results is a way to make it easier to present the results of the overall analysis and see the relationship between the results of the overall analysis. For more clarity, the tabulation of data from the analysis results in the activity "Mapping the Legality Completeness of Situ Kadupayung and Situ Kaduranca Land Plots in the Context of Securing the Administration of Regional Property in the Pandeglang Regency Area, is as follows.

Vol. 4, No.2, p.140-148, 2023
Send: 20-09-2023 |
Received: 17-10-2023 |
Publish: 27-10-2023 |

Table 2. Tabulation Table of Site Area Analysis Results

Situ	Area Based on KIB ($m^{2)}$	Area of Measurement Results ($m^{2)}$	Difference ($m^{2)}$	Spatial Planning (RTRW) Of Pandeglang Regency	Topographic Modeling ($M^{2)}$	Historical Map Interpretation
Kadupayung	40.000	34.462	-5.538	not set	The Area of The Inundation Resulting from Topographic Modeling is 25.000 M^2	Unmapped

Based on the analysis that has been carried out, there is a difference in area between the KIB area and the existing measurement results. Based on the indication of the area of the site resulting from topographic modeling, the indication of the area based on the KIB, that the percentage of land area (border) has a much larger area compared to the water area (puddle), so the results of the analysis conclude that there is a difference in the area of the KIB (Goods Inventory Card) with the area of the results Existing measurements occur in the land area, in other words, indications of the area of the site decreasing or increasing occur in the border area of the site. There are 2 (two) factors that can cause differences in area between the Goods Inventory Card (KIB) data, namely: 1. Internal factors: institutional environment that prepares documents Data Inventory Car; 2. External factors: in the form of natural events (natural) and the people around there and outside there (artificial) which can be explained in detail as follows.

Internal factors that can cause a difference in site area between the area of the KIB (Goods Inventory Card) and the existing measurement results include: a. Measurement techniques used (methods and tools); b. Error in inputting measurement result data. These factors are reinforced by the data contained in the KIB document (Goods Inventory Card), as the area of the site in the document has a whole number, Situ Kadupayung has an area in the KIB of 40,000 m². Basically, an area resulting from a topographic measurement very rarely has a round area, especially since the area being measured has an asymmetrical shape.

There are several external factors that can cause a difference in the area of the site between the area of the KIB (Goods Inventory Card) and the existing measurement results in the form of external factors from nature and also man-made (human). In detail it can be explained as follows:

a. Natural Factors
   1) Sedimentation
      Sedimentation is a further impact of the erosion of the soil layer, the loss of vegetation on the border causes an increase in the rate of erosion of the soil layer on the edge. So the impact is sedimentation which causes the area of the site to decrease, especially the inundation area.
   2) Climate Change
      Climate change can have a real effect on water resources because of the close relationship between climate and the hydrological cycle. Rising temperatures will increase evaporation and trigger increased precipitation. Rising temperatures will also affect water quality through eutrophication, namely a rapid increase in the population of aquatic plants (algae, water hyacinth, etc.) which causes a decrease in water levels.

b. Artificial Factors (Society)
   1) Abuse of authority over land ownership rights or recognition of land that is not owned by him.

JICE Journal Innovation of Civil Engineering
Vol. 4, No.2, p.140-148, 2023
Send: 20-09-2023 |
Received: 17-10-2023 |
Publish: 27-10-2023 |

2) Site occupation which causes a reduction in the site's capacity is caused by the absence of clear site boundaries resulting in massive land grabbing in the area bordering the site.
3) Lack of awareness of all parties regarding the importance of the lake in supporting the environmental ecosystem.
4) The increasing need for community land has led to misuse of space utilization, where the border land is a p rotected area but the existing area is cultivated land.

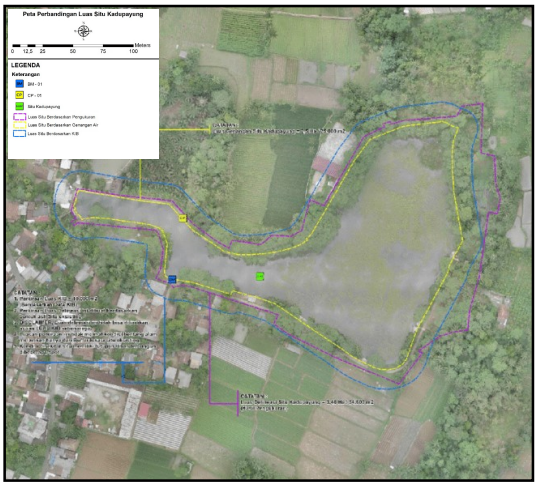

Figure 5. Comparative Map of the Area of Situ Kadupayung
Source: Consultant Survey Results, 2023

4. Conclusions

From the results of the activities that have been carried out, the conclusions of this report are as follows: 1. The area based on the KIB at Situ Kadupayung is 40,000 m². From the results of GPS RTK measurements, it is found that the area of Situ Kadupayung is 34,462 m2 / 3.44 Ha. The difference in area from the measurement results with the goods inventory card (KIB) data at Situ Kadupayung is -5,538 m² / -0.55 Ha. There are 2 (two) factors that can cause differences in area between the Goods Inventory Card (KIB) data, namely: a. Internal Factors: Measurement techniques used (methods and tools); Error in inputting measurement result data. b. External Factors: Natural factors, namely sedimentation, and Non-Natural Factors (Society), namely: 1) Abuse of authority over land ownership rights or recognition of land that does not belong to them. 2) There are no clear boundary markers, resulting in massive land grabbing in the border areas. 3) Lack of awareness by all parties about the importance of the site in supporting the environmental ecosystem. 4) The increasing need for community land has led to misuse of space utilization, where the border land is a protected area but the existing area is cultivated land. 5) Lack of awareness by all parties about the importance of the site in supporting the environmental ecosystem.

The lake border area, also known as the border zone or lake buffer zone, refers to the area or territory that is around the edge of the lake. This area has an important role in maintaining the ecosystem and water quality of the lake, as well as protecting the surrounding environment. The aim is to control human activities, development and land use around the lake so as not to damage the ecosystem and water quality, so there are special provisions regarding space use in border areas.

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