ANALYSIS OF THE SETTLEMENT PATTERN OF LIMBOTO LAKE AREA, GORONTALO PROVINCE

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ABSTRACT

Aryeningsih, Elsa Putri, 2020, Analysis of spatial pattern of settlement area nearby Limboto Lake in Gorontalo Province. Study Program of Geography Education, Faculty of Mathematics and Natural Sciences, Universitas Negeri Gorontalo Supervisor : Dr. Eng. Sri Maryati, S.Si. Co-Supervisor: Daud Yusuf, S.Kom,M.Si. This research was conducted in Limboto Lake. The purpose of this research was to determine the distribution patterns and the history of settlements in the vicinity of Limboto Lake. Accordingly, measuring settlement patterns was done using the nearest neighbor model and analysis. The data collection involved processes, i.e., observation, interview, and documentation. As the research instrument, interview guide was conducted to find out the community's knowledge about the history of the settlements' formation as well as the community activities in the study area. The calculation of the nearest neighbor analysis obtained T value of 0,88 using a mapping software and 0,94 using a manual calculation. Hence, it is concluded that the settlement patterns in the study area formed a random pattern. In addition, the community settlement patterns were influenced by many factors such as topography, slope, accessibility, and geomorphology; thus, not all places necessarily have the same settlement pattern. The settlements in the research are had axisted since the 1800s; that time, leadership in Gorontalo Province was still in the form of a kingdom. The community's main reasons to establish the settlement was to meet their necessities of life, starting by moving to look for areas with potential and natural resources until finally, they found a suitable place to live and settle.

Keywords: Settlement Patterns, Nearest Neighbor Analysis, Settlement History

A. INTRODUCTION

Settlement is a place where residents or the community live and carry out daily activities/activities, where the residence is concentrated so that it forms a settlement pattern. Settlements will cause problems for an area if the construction is not properly organized and is not in accordance with existing regulations. The community in general always builds settlements in areas which they think have potential as a source of livelihood. The community chooses an area that can support the economy without paying attention to the aspects of danger that can endanger them at any time, for example, settlements around volcanic areas which, if seen as having good agricultural potential, have fertile soil and are full of minerals, nutrients which are can be used by the community for farming, but the danger of a volcanic eruption will continue to

overshadow the people who live around the mountain. There are three basic human needs, namely clothing, food and shelter. Based on this statement, it is known that boards are a basic human need and housing is one of them. Settlement patterns are analyzed so that we can find out from the pattern of community settlement, what underlies them to choose to live in the area, and why their settlements can form a pattern.

The urgency that makes settlement patterns must be studied because it relates to solving problems related to settlements, such as the placement of facilities and infrastructure which are still often incompatible with the distribution of population concentrations and settlement development does not pay attention to a suitable place to live in. This results in an imbalance in the availability of facilities and infrastructure with services to residents and other problems that can arise, namely environmental problems, resulting in the formation of certain and different settlement distribution patterns.

Gorontalo Provincial Regulation number 9 of 2017 concerning the Limboto Lake Provincial Strategic Area Spatial Plan (KSP) mandates that the Limboto Lake Area is a Provincial Strategic Area from the point of view of the function and carrying capacity of the environment which includes the core area and the buffer zone of Limboto Lake. Limboto Lake is mostly located in Gorontalo District and is also included in the area of Gorontalo City, Gorontalo Province, Indonesia and is one of the 15 most critical lakes in Indonesia, this is due to forest and land damage in the upstream part. This lake has a depth of between 5 and 8 meters and continues to experience silting from year to year, even though this lake is a source of livelihood for the people around it.

The community uses the plants and living things in it to support their daily lives, on average the people around Limboto Lake work as fishermen. Being a source of livelihood for the community, located in the lowlands, it is not surprising that the area on the outskirts of Lake Limboto is a very strategic settlement place for the community.

The purpose of this study was to determine how the spatial patterns of settlements and the history of settlement formation in the Limboto Lake area, Gorontalo Province.

B. MATERIALS AND METHODS
Research sites

Limboto Lake is a lake located in Gorontalo Province, administratively located in Gorontalo District and Gorontalo City. Limboto Lake has an area of ± 25.37 km2 and is included in the area of 8 Districts, namely West City District, Batudaa District, Tabongo District, Limboto District, Telaga Biru District, Telaga Jaya District, and West City

District. Astronomically, the research location is located between 0 ° 32 '1.002 "NL to 0°32' 1.002" N and 122 ° 56 '12.139 "East Longitude to 123 ° 1' 38,803" East Longitude.

Research variable

The variable in this study is the independent variable (there is only one variable), namely the settlement pattern. Settlement patterns will be seen based on the results of the analysis using images that have medium resolution to high resolution images.

Data collection technique

Literature study

Data collection techniques are based on literature to obtain a collection of the basics of theory contained in books, journals, and other readings that support the writing of this study.

Observation and interview

Observation is observing and recording systematically the phenomena under study. Interviews were conducted to gather information about the history of settlements in the research area.

Documentation

Documentation techniques are used to complement secondary data such as administrative location, area and land use. This data is obtained from agencies related to this research.

Data analysis technique

Analysis of the data used in this study. To determine the distribution of settlement patterns using the analysis of the closest neighbors with the following formula:

$$T = \frac{Jh}{Ju}$$

Information :

T: Nearest neighbor spread index

Ju: The average distance measured between a point and its closest neighbor

Jh: The average distance obtained if all the points have a random pattern

The formula used to find the value of Jh is:

$$Jh = \frac{1}{2\sqrt{P}}$$

Information:

Jh: The average distance obtained if all the points have a random pattern

P: Population density or point density in square kilometers

Meanwhile, to get the P value must first be searched using :

Information:

P = Population density or point density in square kilometers

Meanwhile, to get the P value must first be found using the formula:

$$P = N / A$$

Information:

N = Number of dots

A = Area in square kilometers.

In using the nearest neighbor analysis, the following steps are carried out:

1) Determine the boundary of the area to be investigated

2) Change the distribution pattern of the object to a point distribution pattern

3) Provide serial numbers for each point to facilitate analysis

4) Measure the closest distance, which is the distance in a straight line between one point and another point which is its closest neighbor and record this distance measurement.

After doing the calculation, the index value (T) is obtained, then the T value is interpreted by Continum Nearest Neighbor Analysis which ranges from 0 to 2.15. If T = I, the distribution pattern is said to be clustered. If T = II, the distribution pattern is said to be random. If T = III, the distribution pattern is said to be uniform. Distribution Index Category (T):

1) I = T value from 0 - 0.7 is a cluster pattern.

2) II = T value of 0.8 - 1.4 is a random pattern or a random pattern.

3) III = T value from 1.5 - 2.15 is a uniform or evenly distributed pattern (Uniform / Dispersed Pattern).

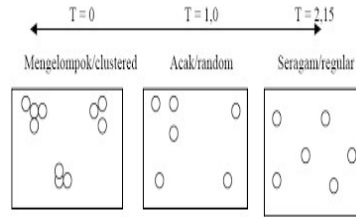Image of settlement distribution pattern can be seen in Figure 1.1.

Figure 1.1 Distribution Pattern of Nearest Neighbor Analysis

C. RESULTS AND DISCUSSION

Research result

Settlement patterns are obtained by analyzing the settlement points, in this study the analysis was carried out automatically using mapping software. The first thing to do is to prepare raster data, namely high-resolution images, the images used in this study are downloaded to SAS planet software. The image has high resolution quality and can be used for free, besides that the image obtained already has a coordinate point (georeference), making it easier for users to manage it. The pattern of distribution of settlement patterns can be seen in Figure 1.2 .
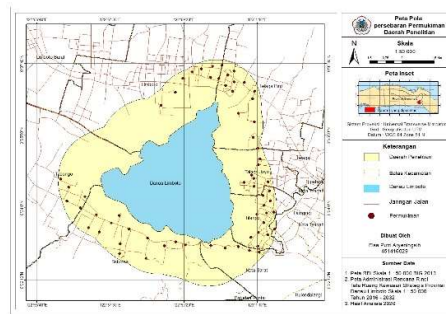

Figure 1.2 Map of Limboto Lake Settlement Distribution Patterns

The settlements obtained are in accordance with the data in the field, each polygon indicates a settlement, from which the polygons created will be a settlement point which is taken based on the midpoint of the polygon. Namely by measuring from the outermost angle of each polygon, these points will be sampled in determining the settlement. It should be noted that settlements are different from settlements so that we can easily understand the patterns of settlement distribution.

The results of the data show that there are 64 settlement points, then measuring the distance between the settlement points as a whole in the Study Area. From the table, it is known that

the area of the research area is 76.30 Km², the average distance of the settlement is 0.5 Km with the number of settlement points (N) is 64, the value of P = 0.91, the value of Jh = 0.52.

$$T = JU / JH$$
$$= 0,5 / 0.52$$
$$= 0,94$$

Based on the number of calculations manually using the nearest neighbor analysis formula, the result of T is 0.94, to find out whether the settlement pattern that has been analyzed is clustered, random or uniform, it must be compared with the continuum value of the nearest neighbor parameter T, for each pattern that can be shown: T = 0-0.7 Clumped pattern, T = 0.71 -1.4 Random pattern, T = 1.41-2.15 The pattern is evenly distributed, so that the comparison of the value of the continuum of the nearest neighbor parameter shows that the pattern of settlement distribution in the lake Limboto forms random patterns.

The second data processing is the calculation of the results of the analysis carried out using a mapping application (ARCgis), the data used are the results of digitizing settlements that have been in the form of points (shp) and area, so that the value of the analysis of the closest neighbor ratio will be obtained. The result shows the settlement pattern of T value obtained is 0.88. After the T value is obtained then compare it with the nearest neighbor parameter value. The results of the analysis of settlement distribution patterns using ARCgis software can be seen in Figure 1.3.
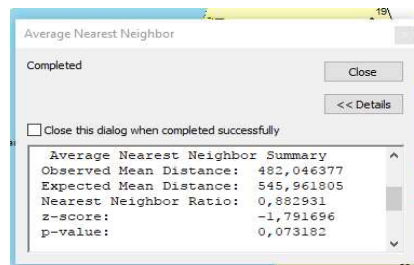

Figure 1.3 Analysis Results Using the ARCGIS Application.

So it can be concluded that the settlement distribution pattern in the Limboto Lake area of Gorontalo Province forms a random pattern. Manual or automatic data processing using a mapping application has a very small / thin difference in T values, namely 0.94 and 0.88. There are differences, such as the average distance and other distances or differences in the measurement of the closest point, which can occur due to differences in the use of distance and area units, although this will not cause an error in the final result, the most important

thing is that data management must be in accordance with procedures and steps that have been determined so as to minimize the errors that will be caused.

Researchers use the final results of the analysis using the application to be used as a benchmark in seeing the final results, because the error rate that is generated when using the mapping application is very small.

The history of settlements can be found out by conducting interviews with people living around Limboto Lake with the main object, namely community leaders. Before conducting interviews in the field, the researcher first made an interview guide that was tailored to the topic to be searched for, then guided the guidance to the supervisor to see the appropriateness of the words and questions to be given to the respondent while in the field. There are several things that are the main topics in this interview data collection, namely about the History and Development of Settlements, the Environment and Facilities that are around the research area, and the last one is Activities and Impacts.

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Table 4.5. Respondent Identity

Noo	Nama	Usia	Pekerjaan	N	E
1	Burhan Rahman S.Sos	56	Kepala Desa	0.31605	123.03603
2	Saat R. Tuli	68	Pemangku Adat	0.613065	123.008005
3	Hamif Lagogi	40	Perangkat Desa	0.35.602	123.00940
4	Asoi A. Tumolango	72	Dukun Kampung	0.565398	122.957257
5	Risman Asmadi	53	Tukang	0.577637	123.015098
6	Ruslan Pakaya	55	Nelayan	0.37012	123.00156
7	Kadar Abu Bakar	50	Nelayan	0.33009	123.00284

Noo	Nama	Usia	Pekerjaan	N	E
8	Yusri Bouti	69	Pensiunan	0.622914	122.988467
9	Zulkifli Tuli	27	Aparat Desa	0.619634	123.002701
10	Roni Djamalu	47	Nelayan	0.565372	122.954513
11	Husni Daud	36	Ketua BPD	0.33520	122.57460
12	Lati Posale	40	Petani	0.555226	122.980680
13	Nasrun Harun	77	Nelayan	0.626199	122.986894
14	Rajiu Umar	70	Nelayan	0.551932	122.987602
15	Rahim Yunus	67	Nelayan	0.578405	122.938068

Table source : 2020 Survey Results.

Discussion

Settlement patterns

Based on the results of manual or automatic analysis using the settlement pattern mapping application in the Limboto Lake area, it forms a random pattern. One of the things that influence the settlement distribution pattern is the environmental conditions around the research area, such as altitude, geomorphological conditions and slope. The condition of the research area tends to have a low topographic condition and a gentle slope so that it is good for being a settlement. Some people use the biota in the lake to meet their needs so that people build settlements in the area. In addition, the existing land in the research area is not only used for settlements but also used by the community as plantation land, most of the community plantation land is the result of silting from Lake Limboto so that within a certain time the land can be flooded and cause crop failure or the land temporarily cannot processed.

History of Settlements

Based on the results of interviews that have been carried out, the initial emergence of settlements in Lake Limboto is due to the desire of the community to find a good place to be a settlement. The search for settlement locations is not only 1 or 2 locations that have been passed but they continue to look for suitable places so that they can find a location that they think suits their wants and needs. Most people used to determine the location of settlements based solely on land use, whether it could be processed as agricultural land or fields and also utilizing other natural resources such as in Lake Limboto, they could use the biota in it either for sale or for their own consumption.

The farming system that exists in Gorontalo is by moving around or in Gorontalo language it is called "Butu" which was practiced by the ancient people, then the government made policies and changed the butu to Butu Payango (permanent garden) where land ownership occurred. If the fields are abandoned again and move places, the fields will become "Bini" which means the former ownership and automatically the fields will become the property of people who have previously cultivated. Transfer of land ownership occurs when there is a sale and purchase transaction or is also inherited for future descendants, because at that time land ownership correspondence was not yet as compulsory as it is now and the land has not been taken over by the government so that people are free to open fields. Until now, the habit of the Butu soil cultivation system still has a negative impact where erosion occurs, causing Lake Limboto to become shallower.

Settlements around Lake Limboto have existed since the 1800s when the government system in the Gorontalo area was still in the form of a kingdom and settlements only existed in the western part of Lake Limboto. The existence of settlements around the lake is inseparable from the desire of the community to fulfill their needs in the past, they moved around who used to live in the mountains and looked for a more comfortable and better place to live in. People in ancient times generally lived in groups, their life was very dependent on nature and there were no rules in building settlements, so they freely took land to be used as a place to live.

The residential houses built by the ancient community have a height of about 2 meters, the traditional Gorontalo house is also actually tall using poles, this is made with the consideration of avoiding animal attacks, under the house can be used for pets or a place to store agricultural products and the last is to avoid water overflow / flooding that will occur at any time in their settlement. The components or materials in making house buildings are still very simple, namely using wood and bamboo, and the arrangement is not good so that it gives the impression of being disorganized. We can find house buildings like this in Tabumela Village (Bombay) where people make settlements without paying attention to their location, such as the distance between houses which is very close so that the kitchen and living room belonging to the community are close to each other.

D. CONCLUSIONS

From the above discussion, it can be seen that the settlement pattern in the study area forms a random settlement pattern with a T value of 0.88. Several things that affect

settlement patterns are topography, slope, area condition, and accessibility in an area. Determining the location of a settlement does not only refer to one's own wishes regardless of the condition of the surrounding environment, because environmental conditions can influence the process of determining the area to be used as a place of settlement. The selection of a good and safe place can be determined by looking at environmental conditions, such as choosing a location that is not at an altitude because it will cause difficulties in reaching the location, not in an area that has a slope of more than 15%, because it creates problems such as disasters nature (landslides) that will occur in the future.

Settlements in the study area have existed since the 1800s and continue to develop until now. In addition to settlements, the land around the lake is used to open fields and raise livestock, so that it can support the economy and the sustainability of the people who live there. Economic needs are not the only things that must be met because they will not be sufficient to support settlement growth. Therefore, it requires facilities and infrastructure that will support activities the community therein such as education, health and worship facilities.

E. ACKNOWLEDGMENTS

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