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ANALYSIS OF THE CARRYING CAPACITY OF RESIDENTIAL LAND IN THE NEW CAMPUS AREA OF UNIVERSITAS SEMBILANBELAS NOVEMBER KOLAKA

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Abstract

Land carrying capacity is an important thing that must be considered in regional development planning so that it is able to support sustainable land use activities. The increasing growth of new residential in Tanggetada District will trigger an increase in the need for land. This will indirectly reduce the area of productive land such as agricultural land to be converted into residential land. The aim of this research is to analyze the carrying capacity of residential land in the new campus area of Universitas Sembilanbelas November Kolaka, Tanggetada District, Kolaka Regency. The method used in this research is the quantitative descriptive method. Data analysis uses the Permenlh formula and Geometric formula. The results of this research show that the carrying capacity of settlements in Tanggetada District in 2021 is 134.9. These results indicate that the land in the new USN Kolaka campus area is still very capable of supporting settlements. The predicted carrying capacity of surface land in the USN Kolaka New Campus Area in Tanggetada District in 2030 is 68 and in 2040 it is 29 which indicates that the USN Kolaka new campus area is able to support residents to settle (build houses) in the area in 2030 and 2040 The predicted population in 2030 is 23,949 people and the predicted population in 2041 is 55,306 people.

Keywords: *carrying capacity, land, settlement*

A. Introduction

Development is basically a social process that is planned or engineered. This development was carried out to overcome problems that arise as a result of population growth, for example settlements. Settlements and housing in a regional spatial plan show the dominance of uncontrolled development and development in both rural and urban areas. The increasing population causes the need for new settlements to also increase. This condition will cause the shrinking of productive land such as agricultural land, both rice fields and others, into built-up land for settlements and housing (Lestari, 2017). Ultimately it will affect the carrying capacity of land in the area.

Land carrying capacity is the ability of an environment to support life or human activities, whether in the form of infrastructure development or human activities to meet their living needs. Land carrying capacity is one of the problems in meeting housing needs, especially for Low Income Communities (MBR). This is related to the affordability of people's purchasing power to meet housing needs and limited land, especially in urban areas (Syarif et. al., 2011).

The development of housing and residential areas is related to the carrying capacity of land which contains two main components, namely the availability of natural resource potential and the carrying capacity of the environment. This is because planning will be able to estimate various possibilities that could occur or estimate the level of population needs adjusted to existing land conditions. One sign of the development of an area is increasing population growth, the development of which is related to the increase in housing and settlements, this is happening in Tanggetada District. This increase in development activity is certainly accompanied by an increase in the need for land to accommodate this development. Development activities are often limited by physical constraints, namely land quality. Limited land capacity shows that not all land use efforts can be supported by that land.

Tanggetada District is located in Kolaka Regency, Southeast Sulawesi. Geographically, it is located in the southern part of Kolaka Regency, Tanggetada District to the north borders Pomalaa District, Kolaka Regency, to the south it borders Watubangga District, to the east it borders Ladongi District, and to the west it borders Bone Bay. Tanggetada District has an area of 476.11 km2. Administratively, Tanggetada District in 2019 consisted of 1 sub-district area and 13 villages. The sub-district area is Anaiwoi Village which is the sub-district capital, while the village area consists of Lamedai, Lalonggolosua, Tanggetada, Palewai, Oneha, Tondowolio, Popalia, Rahanggada, Petudua, Tinggo, Lamoiko, Pundaipa and Pewisoa Jaya. Tanggetada District had a population of 14,371 people in 2019 and experienced an increase in 2020 to 15,604 people (BPS, 2020).

The presence of the new campus of Universitas Sembilanbelas November Kolaka in Tanggetada District has brought about very big changes, especially in Popalia Village which is the center of construction of the new campus of Sembilanbelas November Kolaka University. This change is the increasing need for land for settlements so that land for agriculture is decreasing. Infrastructure development which began in 2015 brought changes, especially in the population density sector. The increase in population caused by the presence of students and teaching staff plus the arrival of economic actors is strongly suspected to be a factor influencing population density. The main motivation for people to move from the area was initially economic. As a result, settlements are becoming increasingly dense due to urbanization (Savitri, 2016).

The increase in population in Tanggetada District will cause an increase in the need for housing. This condition causes the carrying capacity of land in Tanggetada District to decrease. The reduction in the carrying capacity of land is due to the land being permanent while the need for housing continues to increase. This causes land use in Tanggetada District to change.

Based on initial observations, the development of infrastructure and economic actors as well as the construction of new campuses, including housing for teaching staff, requires space as land for residential development and facilities to support population activities. However, on the other hand, the area of Tanggetada District is relatively small. Areas with relatively flat topography experience a reduction in the size of their area. As a result, development land is increasingly limited. Conditions in areas like this are actually very vulnerable to land conversion and uncontrolled development due to the increasing population and lack of development land. So it can be assumed that as the population and new settlements increase, it is possible that the carrying capacity of the area's settlements will decrease. Therefore, this research aims to analyze the carrying capacity of residential land in the new campus area of Universitas Sembilanbelas November Kolaka.

B. Methodology

1. Research Design

This research describes problems related to the carrying capacity of land in the new campus area of Universitas Sembilanbelas November Kolaka in Tanggetada sub-district, Popalia village. Population growth continues to increase causing the level of residential development to continue to creep up. The development of these settlements originates from residential premises built by individuals and developers, which then influences the carrying capacity value of the land. Settlement development can be observed through tangget data in 2020 figures and interpretation of satellite imagery, so that the extent of its development and distribution can be known.

The data needed to calculate the carrying capacity of land in this research is the population, area and area of protected areas, so that calculation results can be obtained that will assess the carrying capacity of the land, whether or not a land is still capable of accommodating people to settle. This data was collected using observation and documentation methods. The results of the calculations and analysis that have been carried out can be used as a reference to determine the effect of residential development on the carrying capacity of land in the new campus area of Universitas Sembilanbelas November Kolaka, Tanggetada district. The following is a chart of the framework for thinking in this research.

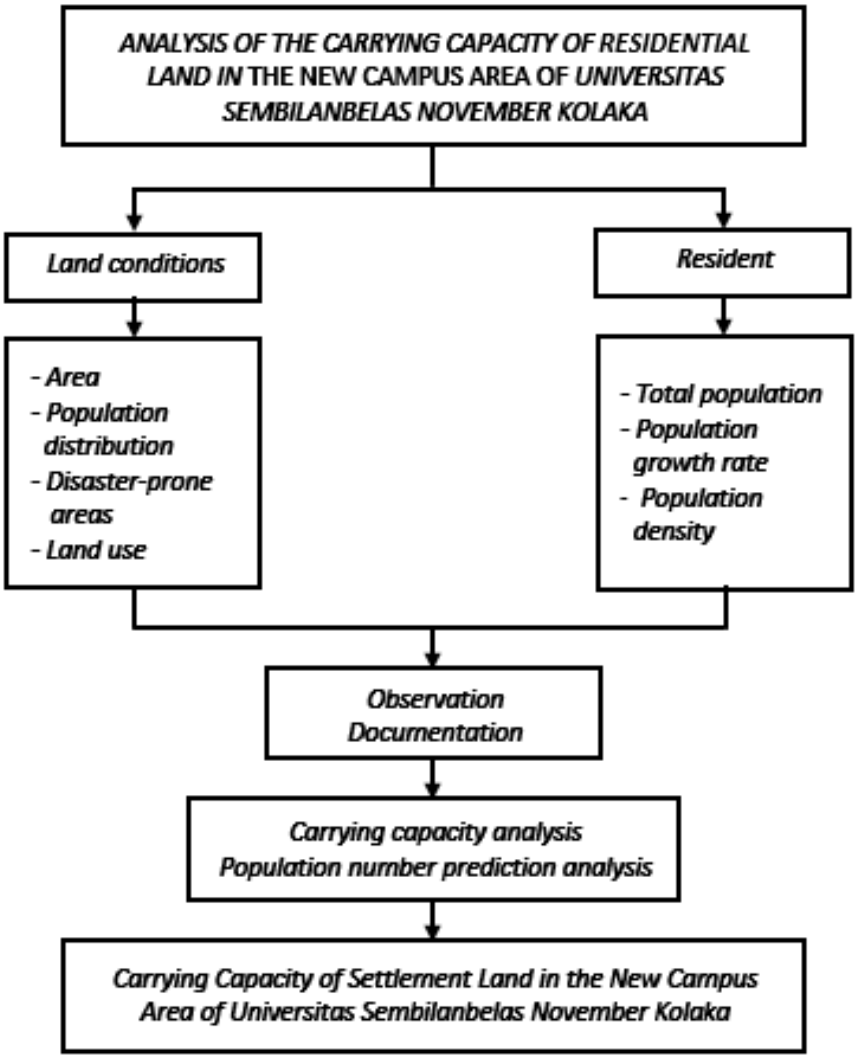

Figure 1 *Research design chart*

3. Technique of Data Analysis

Land Carrying Capacity Analysis

The data processing carried out includes calculating the area's carrying capacity. The area carrying capacity calculation method is based on the Minister of Environment Regulation (PERMENLH) No. 17 of 2009 concerning Guidelines for Determining the Carrying Capacity of the Environment in Regional Spatial Planning. Based on the Minister of Environment Regulation (PERMENLH) No. 17 of 2009, the technique for measuring and determining carrying capacity based on the carrying capacity of settlements is formulated:

$$DDPm = \frac{LPm/JP}{\alpha}$$

Note: DDPm = Housing carrying capacity

JP = Total population

α = Required area coefficient (26 m^2)

LPm = Land area suitable for settlement (m^2)

The area of land suitable for settlement (LPm) can be calculated using the following equation:

$$\mathbf{LPm = LW - (LKL+LKRB)}$$

Note: LW = Area
LKL = Protected area area
LKRB = Area of disaster-prone areas
Land carrying capacity classification can be determined by:
DDPm >1: able to accommodate residents to settle
DDPm =1: there is a balance between the population living (building houses) and the existing area
DDPm <1: unable to accommodate residents to settle (build houses) in the area

Population Prediction Analysis

The predicted population is calculated using the geometric method, namely by taking into account population growth only at the end of the year of a period. The formula for calculating the predicted population in a particular year is as follows (Susanti, 2010):

$$P_t = P_0 (1+ r)^{tp}$$

Note: P_t = Population in year t
P_0 = Base year population
r = Population growth rate and
tp = Time period between the base year and the prediction year
n = Difference in projection year
The steps taken are to calculate population estimates using population growth rates (growth rates) and then calculate predictions of future population numbers based on the growth rates that have been obtained.

$$r = \left(\frac{P_t}{P_0}\right)^{\frac{1}{t}} - 1$$

Note: P_t = Population in year t
P_0 = Base year population
r = Population growth rate

C. Findings and Discussion

1. Findings

Identification of land use change patterns at the research location in 2016-2021

Land use patterns can change according to developments in human needs and progress. Changes in land use patterns will give rise to a phenomenon, namely one land use being sacrificed for another. For example, the use of land that initially functioned as agricultural land was changed to residential land or other facilities. Land that was previously agricultural land and empty land has now been turned into built-up land. Meanwhile, land use: According to Lindgren (2011), land use is all types of use of land resources by humans for agriculture, sports fields, residential homes and other activities as long as there is a connection with land. The rapid development around campus has resulted in irregular residential buildings. The land changes that have occurred are also very visible with the many new buildings that did not exist in 2016 so that in 2021 they will exist. Land use around the new campus of Kolaka Nineteen November University is presented in the following table.

***Table 1**. Land use in 2016 and 2021*

No.	Land Use in 2016 Dan 2021	Land Use Area in 2016	Land Use Area in 2021
1	Settlement	107	61.67
2	Plantation	1,541.04	1,518.55
3	Ricefield	15.83	23.75
4	Thicket	259.37	-
5	Savanna	117.72	-
6	Mixed Dryland Farming	1,764.24	-

7	Secondary Dryland Forest	822.73	-
8	Open Land	19.97	-

Based on the results of the image interpretation carried out, the structure of land use types in 2016 and 2021 was dominated by the use of plantations, settlements and rice fields. The increase in population has resulted in an increase in housing and industrial development, and housing and industrial development has come from changes in agricultural to non-agricultural land use (Bello & Arowosegbe, 2014). Thus, along with the growing growth and changes in the socio-economic structure of the community, the existence of the USN Kolaka New Campus in Tanggetada District as a sub-district whose regional development policy orientation can be a trigger for land use change The pattern of land use change in 2016-2021 in Tanggetada District.

Land Carrying Capacity Analysis

Carrying capacity is an indication of the ability to support a particular use. It is an indication of the tolerance to support changes in a particular use in a particular spatial unit. Land carrying capacity is one of the problems in meeting housing needs, especially for MBR. This is related to the affordability of people's purchasing power to meet housing needs and limited land, especially in urban areas (Syarif, et.al., 2011). As for data on the carrying capacity of residential land in 2021 in the new USN Kolaka campus area, based on the existing land carrying capacity, below is a table of the area of each land carrying capacity as follows Table 3.2. Based on the data obtained above, the Carrying Capacity of Settlements in the new campus area in 2021 is 134.90. Meanwhile, the predicted results of the carrying capacity of residential land in 2030 and 2040 are determined based on predictions of population in 2030 and 2040, which are presented in detail in table 3.3.

***Table 2**. Land Carrying Capacity in 2021*

Location	Jp 2021	Lw (Ha)	Lkl (Ha)	Lkrb (Ha)	LPm (m^2)	DDPm
New Campus Area	12,185	6432,79	2,154	5	42,737,900	134.90

***Table 3.** Prediction of land carrying capacity in 2030 and 2040*

Location	Jp 2030	Jp 2040	DDPm 2030	DDPm 2040
New Campus Area	3,949	55,306	68	29

Based on table 3.3 above, the carrying capacity of settlements for the new campus area of Universitas Sembilanbelas November Kolaka for the predicted year 2030 is 68 and the predicted year 2040 is 29, so it can be concluded that the carrying capacity of residential land in the new campus area of Nineteen November University Kolaka is still able to accommodate residents for stay until the predicted years 2031 and 2041 because they have more space to accommodate the existing population.

2. Discussion

Based on research results, the Housing Carrying Capacity (DDPm) in the new campus area of Universitas Sembilanbelas November Kolaka in 2021 is 134.9. The DDPm value indicates that the land in the new campus area of Universitas Sembilanbelas November Kolaka is still very capable of supporting settlements. Meanwhile, the results of the calculation of the predicted Community Settlement Carrying Capacity (DDPm) in 2030 are 68. This means that the DDPm for the new campus area of Universitas Sembilanbelas November Kolaka is able to support residents to live (build houses) in the area in 2030 and for the calculation of the predicted community settlement carrying capacity (DDPm) in 2040 amounting to 29 DDPm for the new campus area of Universitas Sembilanbelas November Kolaka which is able to support the population to settle (build houses) in the area in 2040. In formulating the regional carrying capacity for settlement, in addition to requiring a land area that is suitable and suitable for settlement but standards and criteria for each resident's land needs are also needed (Muta'ali L. 2015).

The calculation of the carrying capacity of residential land in 2021 in the new campus area of Universitas Sembilanbelas November Kolaka, it is capable of supporting the population to settle (build houses) and the results of the predicted calculation of the carrying capacity of residential land in 2030 and 2040 in the new campus area of Universitas Sembilanbelas November Kolaka are capable of supporting the population to settle (build a house), but in the

predicted calculation of the carrying capacity of residential land from 2021 and 2030 to 2040 there has been a decrease in the amount of carrying capacity of residential land in the new campus area of Universitas Sembilanbelas November Kolaka, this is due to the increase in population from year to year while the availability of land has not increased. Village development that is not balanced with land availability and high land prices and increasing housing needs, causes a decrease in the carrying capacity of land. According to Prilia (2012), the carrying capacity of land in supporting the provision of residential needs must take into account the stability of the foundation, drainage, availability of ground water, disaster vulnerability.

The population in 2021 is 12,185 people, while the predicted population in 2030 is 3,949 and the predicted population in 2040 is 55,306 people. With this, there is also an increase in the need for land use in the new campus area of Universitas Sembilanbelas November Kolaka which is caused by the increase in population from 2030 to 2040. With the population increasing and the need for new settlements increasing, this will result in the shrinking of productive land such as agricultural land, both rice fields and others, into built-up land for settlements and housing (Lestari, 2017).

D. Conclusion

The new campus area of Universitas Sembilanbelas November Kolaka is able to support residents to settle (build houses) in the area in 2021. The research results show that the carrying capacity of land in the new campus area of Universitas Sembilanbelas November Kolaka is able to support residents to settle or build houses. However, the carrying capacity of land for residential communities from 2020 to the predicted year 2040 has decreased due to the increase in population. The population in the new campus area of Universitas Sembilanbelas November Kolaka in 2030 and 2040 will increase to 3,949 and 55,306 people respectively. This condition also causes an increase in the need for land use in the new USN Kolaka campus area which is caused by the increase in population from year to year according to the results of the population prediction calculation.

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