ANALYSIS OF LAND SUITABILITY IN BATANG KAPAS SUB-DISTRICT, PESISIR SELATAN REGENCY

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Abstract: *Population growth affects the increase in land demand for built-up land. Indonesia, which is categorized as a developing country, has the potential to experience a demographic bonus spread throughout the region, not to mention in Batang Kapas sub-district. Batang Kapas Sub-district is one of the areas that have the potential to be affected by the demographic bonus, this is indicated by the increasing demand for building construction and the decreasing use of land in the agricultural sector. The purpose of this study is to provide planning related to the suitability of residential land through a spatial approach with remote sensing technology and geographic information systems. This study uses 6 parameters ranging from digital elevation models to topographic data, flood risk data, and soil characteristics data with the matching method. The results of the study explained that the number of building suitability zones in the unsuitable category reached 0.92% of the total area or 43,958 Ha and for the suitable to very suitable category it was only around 0.05% or a combined area of 2624.91 Ha. This condition makes Batang Kapas sub-district one of the areas that cannot be used as a fully residential area, from the conditions of areas prone to flooding to conditions of steep slopes that do not allow for further development so as to minimize the risk of hydrometeorological disasters.*

Keywords: *land suitability, settlements, sustainable development.*

I. INTRODUCTION

One of the signs of the development of an area is the increasing population growth whose development is related to housing and settlements. The increase in development activities is certainly accompanied by an increase in the need for land to accommodate the development. Development activities are often limited by physical constraints, namely land quality(Umar & Dewata., 2017, Umar., 2017. Umar et al., 2018 and Dewata & Umar., 2019).

Basically, the urban population in developing countries is increasing day by day as a result of various pressure factors. Therefore, the development of residential land plays a major role in urban development (Widiyastuti et al., 2019 and Umar., 2021). Due to the scarcity of land, plantation developers actually pay more attention to vertical development than horizontal development. Most real estate developers try to maximize their profit margins and pay less attention to choosing the best location

(Madurika & Hemakumara., 2017, Umar et al., 2017, Umar., 2018 and Umar et al., 2019).

Land conversion always occurs in the fulfillment of socio-economic activities that accompany urban population growth, the land supply is fixed while the demand continues to increase causing the land use of a city to change towards activities that are more profitable than the existing surrounding potential (Utubulang et al., 2015, Umar., 2018 and Umar 2021). The selection of an important location for settlements has an important meaning in the spatial aspect because this will determine the durability of the building, the economic value, and the impact of settlements on the surrounding environment (Veni, 2016, Umar et al., 2017 and Umar et al., 2018). Changes in land used for settlements are usually found in strategic areas that have good accessibility (Dewata & Umar., 2019 and Taufan & Wilis, 2020).

With the support of geographic information system (GIS) technology, land-use suitability analysis has implemented a transformation from qualitative to quantitative, and GIS-based land-use suitability analysis has become one of the most useful GIS applications (Umar., 2018 and Huang et al., 2019). The development of residential areas in inappropriate areas will endanger the surrounding environment and the human soul as residents of residential areas (Santoso et al., 2019 and Barlian et al., 2019). Therefore, it is necessary to carry out a land suitability analysis for development developments, especially settlements in the Batang Kapas sub-district.

II.   RESEARCH METHOD

The research location is in Batang Kapas sub-district, Pesisir Selatan Regency, West Sumatra Province. Geographically, the research area is located at latitude -1.48 and longitude 100.6 with an area of 359.07 Km2. Data collection techniques in this study by collecting secondary data are as follows.

Table 1. Research Data

No.	Data	Source
1	Topography	Geospatial Information Agency
2	Flood Risk	BPBD Pesisir Selatan
3	Soil Texture	Land Unit and Soil Map
4	Effective Depth	Land Unit and Soil Map
5	Small Rocks	Land Unit and Soil Map
6	Soil Drainage	Land Unit and Soil Map

Data analysis techniques used in this study include overlapping and matching techniques. This method is a way of assessing land suitability by comparing 10 variables of land suitability parameters between regional conditions and certain predetermined criteria. Parameter data for area conditions were obtained from secondary data, while the guideline for determining the land suitability class was determined based on Table 1. The results of the analysis showed that the land suitability value was suitable (S) in three levels (S1, S2, S3), and not suitable (N) in two levels, namely N1 and N2. Based on the results of the land suitability assessment, a land suitability map was made using GIS technology.

Table 2. Criteria for Determining Land Suitability Classses for Settlements

No.	Indicator	Sub Indicator	Dignity
1	Slope	0 - 8 Flat	4
		8 - 16 Ramps	3
		16 - 27 Tilt	2
		>27 Steep	1
2	Flood	Without	3
		Rarely	2
		Often	1
3	Drainage	Good to Very Good	3
		Medium	2
		Slightly Poor to Obstructed	1
4	Texture	Slightly Coarse (Sand Loam, Loamy Sand, Sand)	3
		Slightly Fine (Sandy Clay, Dusty Clay Loam, Loamy Loam, Sandy Loam)	2
		Smooth (Dusty Clay, Clay)	1
5	Rock Gravel	Little	3
		Medium	2
		Multiple	1
6	Effective Depth	Shallow (<50 cm)	3
		Medium (50-90 cm)	2
		Deep (>90 cm)	1

Source: Umar et al., 2016: Umar et al., 2017: Umar, 2018: Umar & Dewata, 2018: Umar et al., 2019)

III. RESULTS AND DISCUSSION

The steps taken in analyzing land suitability for settlements is to use the Overlay approach, where each parameter is classified first. The following is a map description of the 6 parameters used.
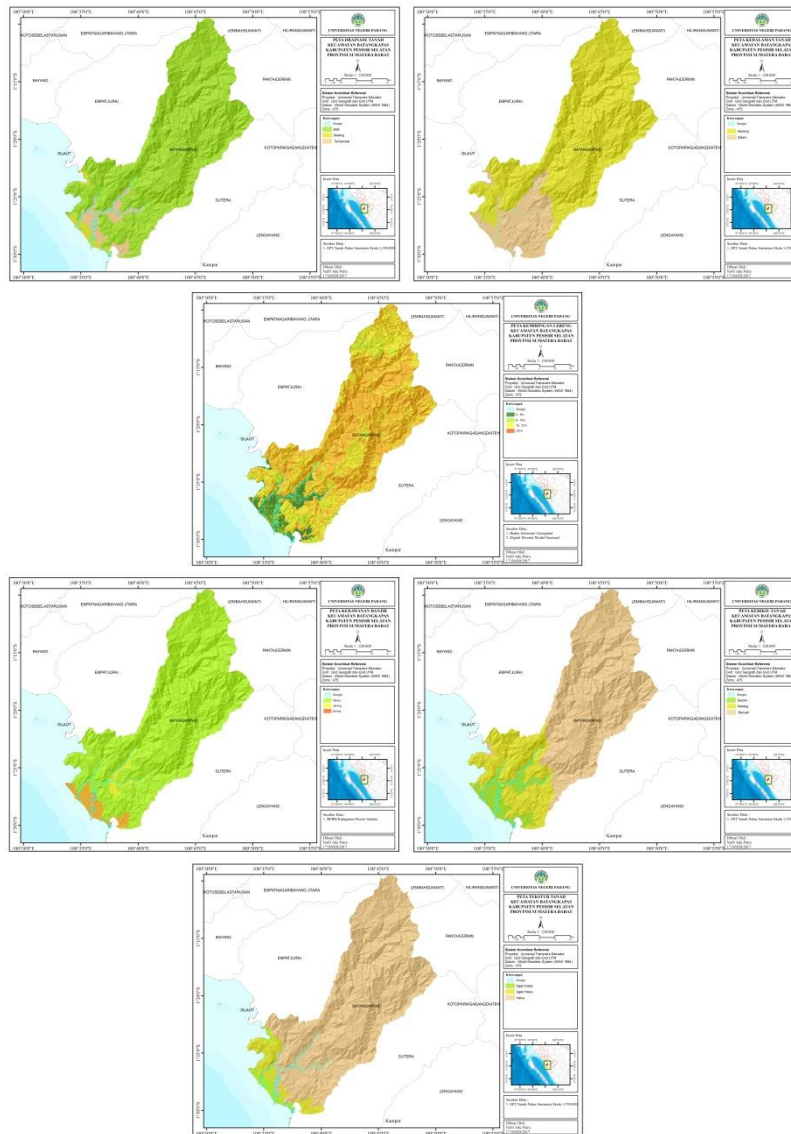

Figure1. Map of settlement land suitability parameters

Figure 1 describes the parameter classification that was carried out first to determine the score of each feature. The slope is one of the parameters in this study because the requirement in determining where to live in the slope because the topography of the Batang Kapas area is flat and hilly as an extension of the Bukit Barisan with a sea level of 2-25 meters. The condition of the slopes in Batang Kapas sub-district is that almost the entire Batang Kapas Subdistrict is classified as steep

and sloping, only 1/5 of the land that may be used as a place of settlement. In terms of hilly terrain, this area makes the downstream area almost entirely vulnerable or often affected by flooding, while the drainage is fairly smooth or good (0.92%), and (0.02) is moderate, and (0.06) is inhibited. Judging from the soil texture in Batang Kapas sub-district, 0.91% is fine, 0.02% is a bit rough, and 0.07% is rather fine, almost the entire area of Batang Kapas is finely textured.

Distribution of gravel in Batang Kapas sub-district, here we can see that 0.68% of the Batang Kapas sub-district is filled with gravel, 0.24% is a medium capacity in the middle of the Batang Kapas area, and another 0.08% on the coast there are few pebbles because they are predominantly sandy. Then the condition of the effective depth of soil in the Batang Kapas sub-district, here we can see that more than half of the Batang Kapas sub-district in the hilly upstream is in the Medium effective depth (0.81%), and the rest in the downstream part is at Daman effective depth (0.19). The results of the combined overall analysis of scoring and weighting of the 6 parameters explain the different levels of suitability, the following is a map of the suitability of land for settlements in the Batang Kapas area.
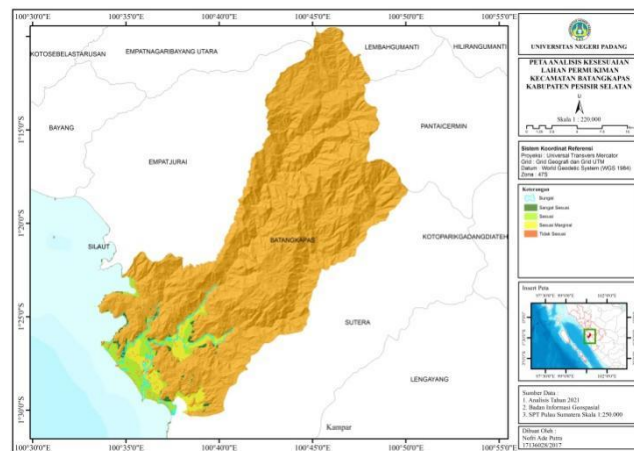

Figure 2. Map of Land Suitability Analysis for Settlement in Batang Kapas Sub-district

Table 1. Area of Suitability for Settlement Land in Batang Kapas Sub-district

No.	Category	Area (Ha)	Percentage (%)
1	Very Suitable	658,71	0,01
2	Suitable	1966,20	0,04

3	Marginally Suitable	1447,09	0,03
4	Not Suitable	43958	0,92
	Area	48030	1,00

Source: Analysis, 2021

Information obtained from Figure 2 and Table 1 shows the description of the land suitability analysis map for settlements in Batang Kapas Sub-district consisting of 6 parameters, resulting in 4 categories of land suitability for settlements starting from the highest category very suitable, suitable, marginally suitable, and not suitable. The index value of the inappropriate category is 0.92% or an area of 43,958 ha, the marginally suitable category is 0.03% or an area of 1447.09 ha, the appropriate category is 0.04% or an area of 1966.20 ha, and the category is very suitable 0.01 % or an area of 658.71 Ha, with an area of exposure reaching 48,030 Ha.

IV. CONCLUSION

Batang Kapas Sub-district has the opportunity for potential constraint zones with a high level of non-conformance affecting the next few years, with the need for built-up land getting higher and the high land-use change potentially accelerating changes in land use towards residential settlements. However, to minimize the risk of disaster victims, it is necessary to use zones that are very suitable and optimally appropriate in the area as well as education to the sector of local policymakers and local communities to continue to build safe zones in order to overcome disaster risks that will occur from the effects of global warming to other hydrometeorological disasters.

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