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SPATIAL ANALYSIS OF HOUSING DEVELOPMENT AND SETTLEMENT WITH UTILIZATION GEOGRAPHIC INFORMATION SYSTEM IN NIAS REGENCY

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ABSTRACT

The aim of this study is to know the land suitability of housing and settlement development in Nias Regency by utilizing the Geographic Information System. This study considers six physical parameters, that is: slope of land, type of rock, type of soil, rainfall, land use and accessibility. Through analysis of land capability units using weighting techniques for each physical parameter and overlay technique on ArcGis, the location of land suitability for housing and settlement development in Nias Regency will be known, then the results are grouped into 3 (three) classifications, High (H) or very suitable, covering an area of 27,384.25 hectare or 48.35%, Medium (M) or suitable, covering an area of 28,452.15 hectare or 50.24% while a low or unsuitable (L) area of 795.93 hectare or 1.41%.

KEYWORDS: *Geographic Information Systems, Spatial, Housing and Settlement*

INTRODUCTION

One supporting aspect for land use in accordance with its designation is the consideration of basic physical aspects. According to Minister of Public Works Regulation No.20 of 2007 concerning Technical Guidelines for Analysis of Physical, Environmental, Economic and Socio-cultural Aspects, in preparing spatial plans, consideration of basic physical aspects can illustrate the characteristics of the land so that it is known the level of land capability in supporting development including settlement activities [1].

Since the proliferation in 2010, the capital of Nias Regency is still in Gunungsitoli but then the issuance of Government Regulation of the Republic of Indonesia (PP RI) No.30 of 2016 then the location of the capital of Nias Regency transfer from Gunungsitoli to Gido Subdistrict [2].

With the transfer of the location of the Nias regency capital, it is necessary to have a comprehensive and sustainable regional development plan throughout the Nias Regency due to increased development activities in various fields to meet community needs, such as the construction of

residential facilities and infrastructure, road infrastructure, economic and social facilities.

Based on the Nias Regency Regional Spatial Plan for 2014-2034, one of the strategies for developing coastal areas in Nias Regency is to develop urban and rural residential by developing urban and rural settlements which in accordance with the physical, socio-cultural and economic characteristics of the community. It should also supported by the provision of settlement facilities and infrastructure, improvement of the quality of settlements by the provision of affordable and habitable housing, accessibility to adequate housing especially the most vulnerable, availability of adequate facilities and meeting living standards.

OBJECTIVES OF THE STUDY

Analyzing the suitability of land of housing and settlement results of this study with Nias Regency Spatial Plan.

RESEARCH METHODOLOGY

This research is a descriptive research with quantitative research method. Collection of primary data by conducting surveys and to get existing data on housing and settlement land use in Nias Regency are conducted in the following ways:

1. GPS (Global Position System)
2. Camera
3. Satellite imagery
4. Modes o transportation
5. Drone and so forth

Secondary data collection was conducted by an institutional survey of the relevant agencies, namely: the Central Bureau of Statistics (BPS), the Regional Development Planning Agency (Bappeda), the Public Works Agency, the Housing and Settlement Service and other agencies related to this research. Quantitative analysis is used to conduct spatial analysis of housing and settlement development, as well as mathematical models that are relevant to the object of study.

Analysis of scoring land suitability results from scoring in the form of land suitability maps for housing and settlement development with the 2014-2034 Spatial Plan Map of Nias Regency through an overlay process. This is because spatial plan provides recommendations for managing land use for housing and settlements, so an alignment analysis between the results of the study with the Regional Spatial Plan (RTRW) is needed.

LITERATURE REVIEW

According to Law No. 1 of 2011 concerning Housing and Settlements, the definition of Housing and Settlement Area is a unified system consisting of renewal, housing, provision of settlements, maintenance and repair, prevention and quality improvement of slums and slums, land provision, funding and financing systems, as well as

community participation. Housing is a collection of houses as part of settlements, both urban and rural, which are equipped with infrastructure, facilities and public utilities as a result of efforts to fulfill habitable homes while settlements are part of the environment outside protected areas, both in the form of urban and rural areas, which serves as a place to live and a place for activities that support life [3].

According to Sadana [4], the real difference between settlements and housing lies in its function. In residential areas, the environment has a dual function, namely as a place to live and at the same time a place to make a living for some of its inhabitants. In housing, the environment is only a collection of houses that serve as a place to live. The function of housing is only a place to live, and does not serve as a place to earn a living.

The general factors used to research building location technically are:

- a. Topography
- b. Land and building conditions
- c. Vegetation condition
- d. Water availabilityr

Suprpto, et al in Hia Yupiter [5] states that land suitability for settlements is related to settlement location requirements determined in the variable of relief (slope, flow density, and depth of groove), geomorphological process (flood, erosion rate, and rock mass movements), and rock material variables (wear, weathering, and rock strength, carrying capacity, and wrinkle growth).

According to Yunus [6], the impact of spatial transformation on settlement land can be observed in four terms, namely (a) Increase in residential land area, (b) Compaction of residential buildings, (c) Trend of segregation of residential areas and (d) Outbreak of settlements.

According to Rahardjo in Hia Yupiter [5], the basic principle in the allocation of resources based on spatial planning is to achieve benefits optimally by considering environmental conditions. Spatial allocations are formulated using basic principles that are interrelated, as follows:

1. Suitability
2. Continuity of natural resources and environment
3. Democratization of spatial allocation (spatial)
4. Regional synergy

RESULTS AND DISCUSSION

Determining the suitability of land for housing and settlement development is done by overlaying the 9 (nine) Land Capability Classification (LCC) maps. Each shape of the LCC map file is in an overlay by using the tools union on Arcgis.

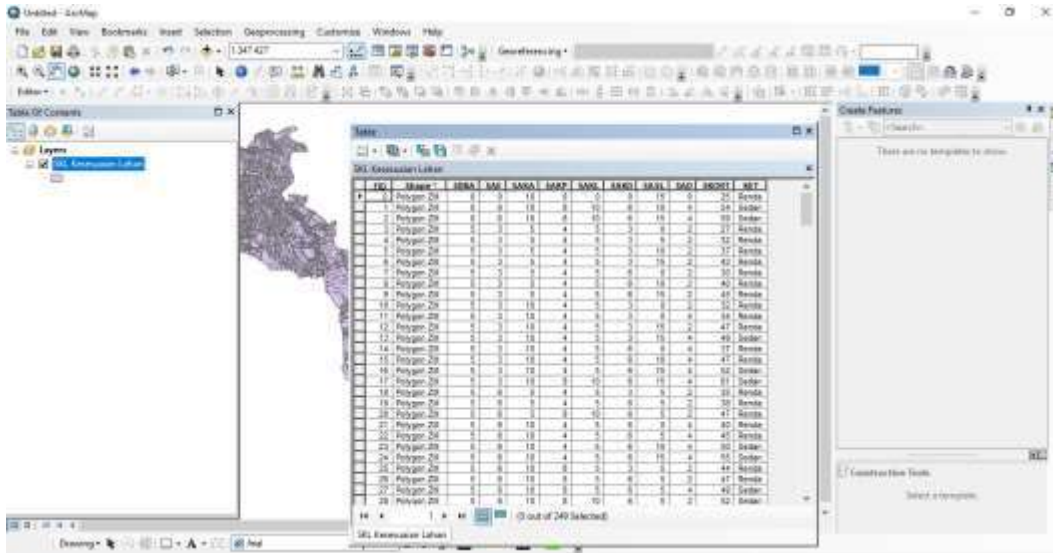


Figure 1. Overlay Process in Arcgis, 2018

Source: Data analyzed, 2018

The results of the analysis of land suitability for housing and settlement development are land suitability maps that describe the pattern of housing and settlement land in Nias Regency in 3 (three) suitability classification, namely:

- 1) **High (H)** with an area of 27,384.25 hectare, which means it is very suitable for housing and settlement development, where 6 (six) parameters are physical criteria, that is slope of land, type of rock, type of soil, rainfall, land use and accessibility (road) used to produce nine units of land capability, that is LCC of low morphology with gentle slope (0% -8%), LCC is easy to build with alluvium soil types, and limestone is very suitable for settlement area, LCC of slope stability, with steep slope stability between 0% -15% with rainfall between 1000-5000mm / year, LCC of foundation stability with steep slope stability and limestone and alluvium parent material types can provide support capacity and foundation stability which is good, LCC of water availability with very high rainfall > 3000mm / year, LCC of erosion is very low, LCC of drainage is high, LCC of waste disposal and LCC of natural disaster with less potential because of the 0% -8% gentle classification slope, is a very suitable location to be developed into housing and settlement in Nias Regency.
- 2) **Medium (M)** with an area of 28,452.15 hectare, which means that the area is suitable for the development of housing and settlement.

- 3) **Low (L)** with an area of 795.95 hectare, which means that the area is limited or not suitable for housing and settlement development, which is based on physical criteria with 6 (six) parameters, slope of land, type of rock, type of soil, rainfall, land use and accessibility (road) is not suitable to be developed into housing and settlement in Nias Regency. Nine LCCs do not support development for housing and settlement. Various obstacles due to the high LCC of morphology with steep classification slope (≥45%), LCC of easy to build with the type of parent material of alluvium peat are not suitable for residential areas, LCC of stability slope with low slope stability between 15% -45 % with rainfall between 1000-5000mm / year, LCC of foundation stability with low slope stability, LCC of Availability of Water with high rainfall between 2300-4000mm / year, LCC of erosion is very high, LCC of drainage is low, The LCC of waste disposal and natural disasters is less potential because it is on a slope of 15% -45%, the classification is rather steep to very steep, not suitable to be developed into housing and settlement.

The land suitability map has been overlaid with a forest map based on the shapefile Decree of the Ministry of Forestry No. 579 / Menhut-II / 2014 dated June 24, 2014 concerning Forests in North Sumatra Province. The forest in the shapefile is forests in Nias Regency (Table 1)

Tabel 1
Land Suitability of Housing and Settlement Development in Nias Regency

No.	Classification	Potential developer area (Hectare)	Description
1	High (H)	27.384,25	Very suitable
2	Medium (M)	28.452,15	Suitable
3	Low (R)	795,93	Unsuitable
Total		56.632,33	

Source: Data analyzed, 2018

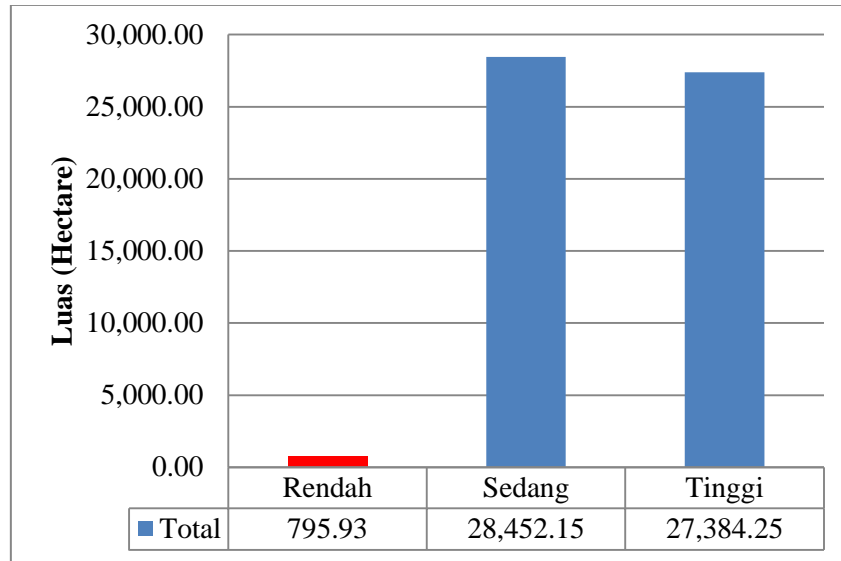


Figure 2 Suitability of Housing and Settlement Development land Diagram
Source: Results of Analysis in 2018

Determination of potential locations that are suitable for the development of housing and settlements are classified as High (H) and Medium (M), while Low classification (L) is not included due to limited development. Based on the diagram above, it shows that the area of land suitability for

housing and settlement development in Nias Regency with a classification of High (H) and Medium (M) is 55,836.40 Hectare. Land Suitability Map of housing and settlement development in Nias regency can be seen in Figure 2.

Tabel 2
Land Suitability for Development of Housing and Settlement in Nias Regency per sub-district

No.	Subdistrict	Area of Housing and Settlement Development (hectare)		
		High (H)	Medium (M)	Low (L)
1	Idanogawo	5.630,87	7.569,80	80,22
2	Bawolato	6.089,56	11.049,42	608,88
3	Ulugawo	185,10	408,97	1,66
4	Gido	6.190,74	4.194,10	24,64
5	Ma'u		335,26	231,54
6	Somolo-molo	574,82	1.310,39	12,66
7	Hiliduho	2.163,35	400,98	1,95
8	Hiliserangkai	957,64	537,86	4,37
9	Botomuzoi	2.838,50	1.085,14	19,81
10	Sogae'adu	2.418,40	1.663,93	41,75
Total		27.384,25	28.452,15	795,93

Source: Data analyzed, 2018

The table above shows the suitability of land for housing and settlement for each subdistrict in Nias Regency. The widest potential for housing and

settlement development is in the subdistrict of Bawolato with an area of 6,089.56 classified as High (H) and 11,049.42 with the classification of medium

(M). Whereas for Ma'u sub-district has a low land suitability classification (L) because it is in a highland area and some areas are included in the Nias Regency protected forest.

The Nias Regency Spatial Plan for 2014-2034 is the basis for recommendations on spatial use

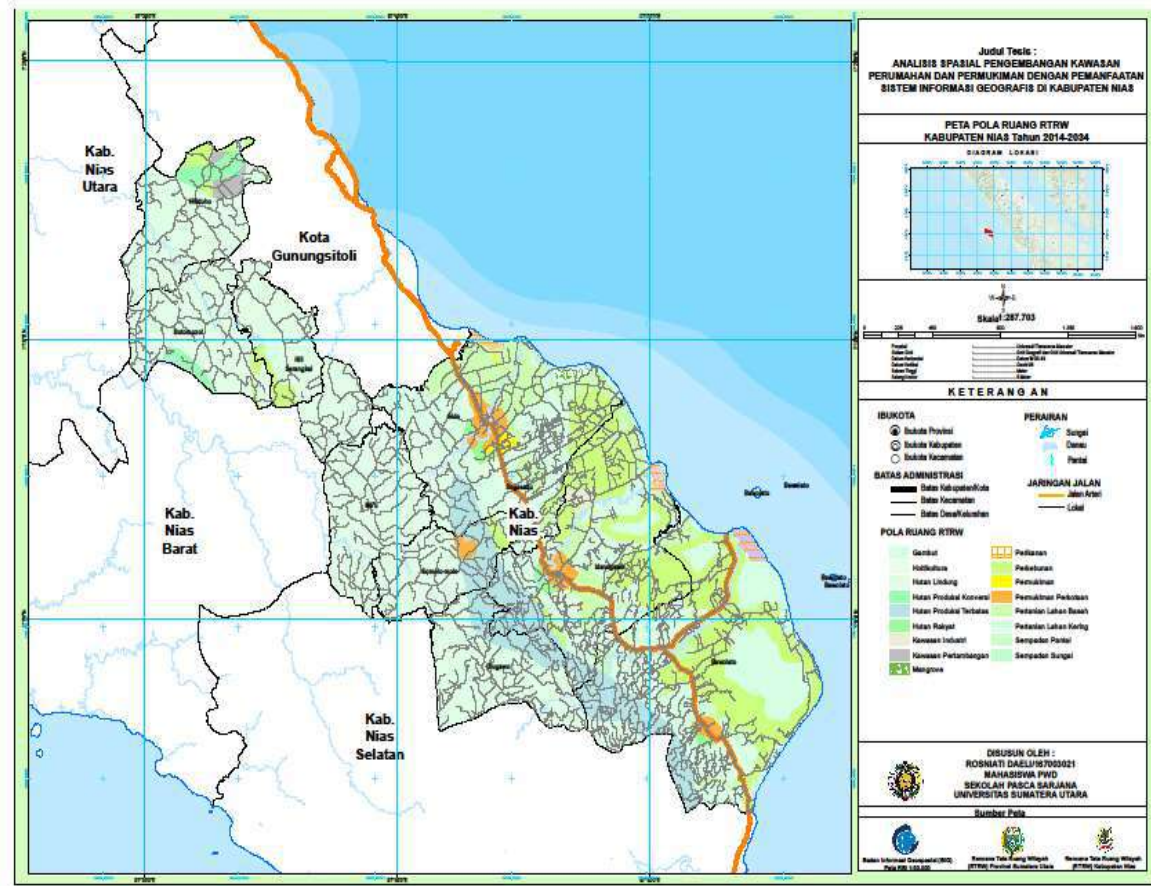
including housing and settlements. It is necessary to conduct an alignment analysis between the results of the study with the Nias regency spatial plan map which aims to determine the distribution of existing settlement locations. The Nias Regency spatial plan map can be seen in Figure 3.

Tabel 3
Land Suitability for Housing and Settlement Development in Nias Regency with Nias Regency Spatial Plan for 2014-2034

No.	Land Use	Classification (hectare)		
		Low	Medium	High
1	Settlement (Spatial Plan)		196,19	766,67
2	City Settlement (Spatial Plan)		645,03	886,90
3	Planning Development	795,93	27.629,03	25.736,56
	Total	795,93	28.470,25	27.390,12

Source: Data analyzed, 2018

Based on the table above, the total area of existing housing and settlements included in the medium classification is 841.22 hectare or 2.95% of the total number of land area classified as Medium (M). For High Classification (H), the area of housing and settlement is suitable for 1,653.57 or 6.04% of the total area of housing and settlement development in Nias Regency. When overlaying maps, it was found that there were differences in the area for housing and settlement development in the amount of 2,494.79 hectare. This difference is caused by the level of smoothness in the process of digitizing the map. Distortion map of Land Suitability for Development of Housing and Settlements in Nias Regency with Nias Regency spatial plan for 2014-2034 can be seen in Figure 3.



Peta Pola Ruang RTRW Kabupaten Nias Tahun 2014-2034

Figure 3. Nias Regency spatial plan map

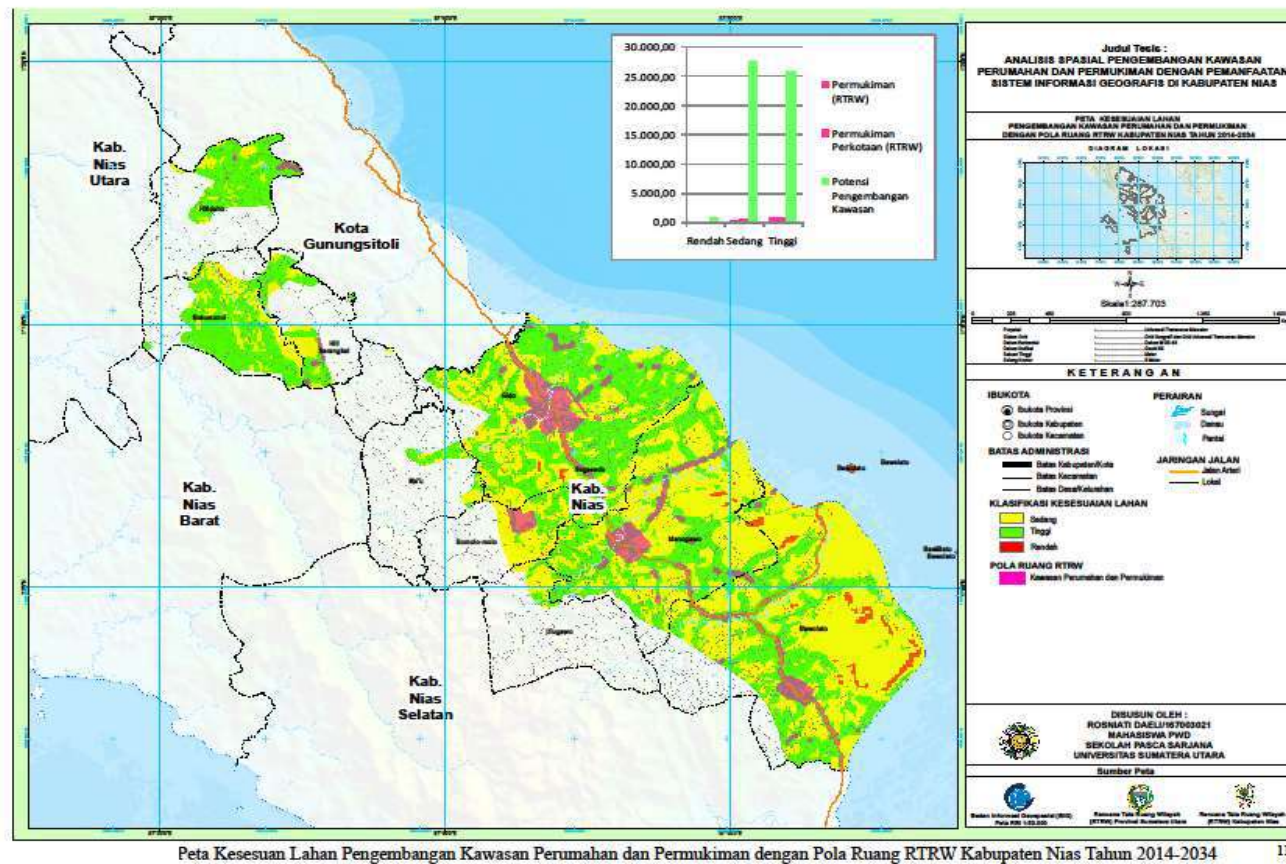


Figure 4. Distortion map of Land Suitability for Development of Housing and Settlements in Nias Regency with Nias Regency spatial plan for 2014-2034

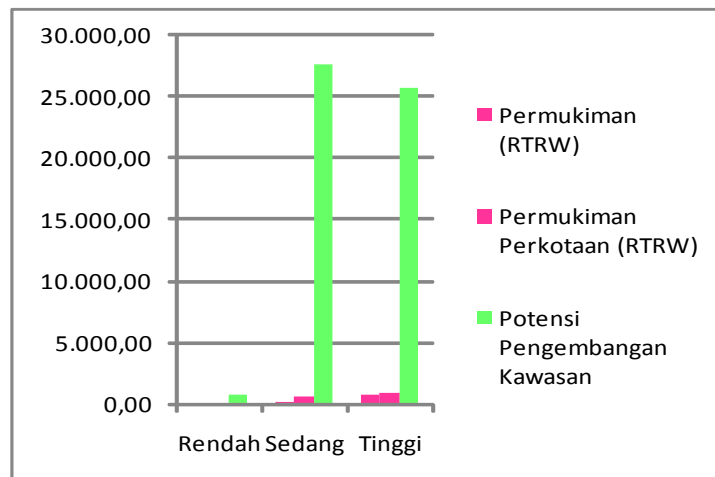


Figure 5 Land suitability diagram for housing and settlement development with Nias regency spatial plan for 2014-2034

Source: Results of Analysis, 2018

The above diagram clearly shows that the development of housing and settlements of the study results is far wider than the existing conditions of spatial patterns in the Nias Regency RTRW 2014-2034.

CONCLUSION

Based on the results of the study, the development of housing and settlement of this study compared with the Nias Regency spatial plan for 2014-2034 have a very significant differences where the results of distortion indicate the total area of existing housing and settlements included in the Medium (M) classification is 841.22 Hectare or 2.95% of the total area of Medium (M) classification land area. For High Classification (H), the area of housing and settlement is suitable for 1,653.57 or 6.04% of the total area of housing and settlement development in Nias Regency.

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