Evaluation ff Settlement Land Suitability Based on Remote Sensing and Geographical Information Systems in The City of Ambon

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A B S T R A K

Peningkatan kebutuhan lahan permukiman telah menyebabkan pemanfaatan yang berbeda berdasarkan tingkat kesesuaiannya. Kajian ini mengevaluasi kesesuaian lahan untuk permukiman, faktor pembatas, dan prioritas pemgembangan. Metode yang digunakan adalah kualitatif dengan analisis spasial dan kuantitatif dengan pengharakatan berdasarkan satuan lahan. Penelitian ini menggunakan data Landsat 8 OLI/TIRS, DEM SRTM, peta administrasi, jenis tanah, litologi, dan bentuk lahan. Data dianalisis berdasarkan citra satelit, pengharakatan dan tumpang susun (overlay). Hasil kajian menunjukkan bahwa pengolahan citra satelit dengan akurasi yang baik. Untuk kesesuaian lahan permukiman didominasi oleh kelas sangat tidak sesuai seluas 23592,48 ha, sedangkan luas sangat sesuai seluas 6033,39 ha. Untuk arah pengembangan permukiman, prioritas I seluas 3.181,34 ha, prioritas II seluas 2.852,05 ha, dan prioritas III seluas 8.237,89 ha. Temuan dalam penelitian ini dapat dilihat pada perkembangan permukiman di kawasan yang tidak sesuai (D2 II Pm), seluas 204,19 ha. Oleh karena itu, pemerintah daerah perlu menerapkan peraturan daerah secara tegas untuk menciptakan kelestarian lahan dan mencegah dampak yang mungkin timbul.

Keywords:

Land Suitability

GIS

Remote Sensing

A B S T R A C T

The increasing need for settlement land has led to different suitability-based uses. This study evaluates land suitability for settlement, limiting factors, and development priorities. The methods used is qualitative with spatial analysis and quantitative with grading based on land units. This study uses Landsat 8 OLI/TIRS data, SRTM DEM, administrative maps, soil types, lithology, and landforms. Data was analyzed based on satellite imagery, approximations, and overlays. The study results show that processing satellite imagery with reasonable accuracy. For land suitability for settlements, the very unsuitable class is dominated by an area of 23592.48 acres, while the very suitable place is 6033.39 acres. For the direction of settlement development, priority I covers an area of 3,181.34 acres, priority II covers an area of 2,852.05 acres, and priority III covers an area of 8,237.89 acres. The findings in this study can be seen in the development of settlements in the regions that are not suitable (D2 II Pm), covering an area of 204.19 acres. Therefore, local governments need to apply regional regulations strictly to create land sustainability and prevent any impacts that may arise.

INTRODUCTION

Urban growth is a humanistic phenomenon inherent in the earth's surface that arises along with economic development and population growth. With this high population growth in urban areas, it is projected that by 2050, as many as 67.1 percent will live in urban areas (C. Li et al., 2017). In Asia in 2019, population growth reached 111,000 over a 25-year period from 1992 to 2016 and converted non-urban land to urban land. It covers an area of 144,000 km2 (Ghasemkhani et al., 2020).

According to the United Nations (2018), the increase in the urban population in Indonesia between 1960 and 1970 was around 131.47 million, while in rural areas, it only reached around 44.71 million residents (Putra et al., 2022). Based on World Meters, (2020), in the year 2020, the population living in urban areas reached 154.2 million, or 56.4 percent of the total population of Indonesia, namely around 274 million. It is projected that in 2025 it will be close to around 170.4 million, or 59.3 percent of the total population, namely 287 million (Bukhari, 2021).

This population increase, in turn, will impact the high population density in urban areas. Besides that, it also impacts social and environmental aspects, such as air pollution, traffic jams, and resource shortages (Liao et al., 2019) declining air quality, shortage of land resources, and fragmentation of natural space (Huang et al., 2019), and put significant pressure on urban ecological security (H. Wang et al., 2021). According to (Yunus, 2008).The growing urban population has significant spatial implications for the need for residential land (Lasaiba, 2013).

Increasing housing needs, especially in urban areas, have recently become a significant concern about the consequences of land unsuitability (Utaya, 2002). This mismatch is due to the increasing demand for land, thus creating increasingly serious conflicts between land use types (He et al., 2017). The impact of various increases in built-up land is the conversion of agricultural land (Lesmana et al., 2022). These problems are caused by plans or policies for allotment of land use that have yet to properly evaluate the land for its characteristics and quality (Akbari et al., 2019).

Land evaluation is integral to land use planning (Omar & Raheem, 2016). Land use suitability assessment is considered a prerequisite for use planning and management (Ramya & Devadas 2019). The benefits of land suitability assessment are intended to determine the suitability of a particular area for a particular land use and to estimate land potential. According to Sitorus (1998), land suitability is closely related to the suitability of a land area for a specific use (Aldiansyah & Wibowo, 2022).

In evaluating land suitability, a database is needed to inventory land resources so that they can be appropriately managed (Lazoglou & Angelides, 2020). In determining land suitability, it has been applied in various aspects, and one of them is the suitability of settlements (Aldiansyah & Wibowo, 2022) According to Rapoport (1969), a settlement is an area that is functionally the basis of human activity and is influenced physically and non-physically (Herliatin & Harudu, 2016; Yusrina et al., 2018). Settlement development is faced with an ever-increasing population, while suitable land is increasingly limited in urban areas (Setyowati, 2007).

In inventorying land suitability, it is essential to have a basis. Geographic Information System (GIS) is a tool for studying geospheric phenomena and a basis for making decisions related to the spatial planning of an area (Alwin et al., 2020), and as a database has been used as a solution for easily inventorying land suitability, improving the spatial accuracy of data, and enabling faster data access. In addition, GIS has become the basis for stakeholders making policies related to spatial planning (Sya'ban & Adiputra, 2020). The linkage with GIS is simultaneously remote sensing with a wide range of resolutions that can be applied spectrally, radiometrically, spatially, and temporally (D. Li, 2010; Lu et al., 2016; Yulianto et al., 2016, 2019).

The use of remote sensing aims at natural resource management, land use planning, disaster mitigation, weather and climate monitoring, and other purposes (Azhari et al., 2022; Y. Wang et al., 2020). Its expansion has provided convenience for users and can reduce various risks in field survey activities (Setiawan & Rachman, 2020). This technology has been used to determine land suitability (El Baroudy, 2016).

The use of GIS and remote sensing in evaluating land for settlements is urgently needed along with the development of cities and an increasing population (H. Wang et al., 2021). The basis for evaluating the suitability of settlement land in Ambon City is a database inventory of land use. Ambon City is one of the small cities in Indonesia, and its territory is dominated by hilly areas, around 89 percent, and the rest is plains. This consequence becomes a dilemma when settlement development is essential for human life. On the other hand, the main obstacle is land damage due to the exploitation of unsuitable land. This condition is also a consideration in a land clearing where there is no more vacant land in plain areas, so hilly areas are the goal of development activities. What underlies the research conducted to compile a land use database with GIS and remote sensing is classifying land units, land suitability classes for settlements, limiting factors, and development priorities.

METHODS

Time and Location of Research

The location in this study is Ambon City, the center of the province, which is geographically located between 30 - 40 degrees south latitude and 128 - 129 degrees east longitude (Figure 1). In general, in the middle of Maluku Province, which is included in the Ambon and Lease Islands clusters, The area is flanked by the Banda Sea, which has a depth of 7,000 meters, and the Seram Sea, which has a depth of 5,000 meters. It is also surrounded by the Leihitu and Leitimur Peninsulas, which go across the Inner and Outer Ambon Bays and inland around the Ambon Bay waters. The area of Ambon City is around 359.45 km2 with a coastline of 98 km, divided into four sub-districts and 46 sub-districts. The time to carry out the research is from April to August 2022.

Tools and Materials

The material in this research is Landsat 8 OLI/TI RS 2022 (Path 109, Row 63) zone 52 on the WGS datum 1984 obtained from USGS GloVis for land use maps and SRTM DEMs with a resolution of 30 meters obtained from the National DEM for slope map extraction. administrative map from Bappeda of the city, map of the distribution of soil types from the Unpatti Faculty of Agriculture, lithology maps, and landform maps from the Municipal Mining Service, as well as conducting field observations. While the tools used are a geological compass, digital camera, Garmin handheld GPS, field stationery, and software, including Microsoft Excel, Er Mapper 7.0, ArcGIS 9.3, and Global Mapper 15.0.

Types of research

The process of analysis and evaluation is carried out qualitatively with a spatial analysis of the results of the overlapping of all land parameters. In contrast, quantitative analysis is carried out by giving vows in assessing the potential of the land in order to determine its value and vowel.

Methods of data collection, processing, and analysis

Based on the source, the data in this study can be grouped into primary and secondary data. Primary data collection is carried out by direct observation based on field and laboratory measurements. Secondary data was obtained from literature reviews and related institutions. The presentation of data is described based on the observed variables, including inundation or flooding, erosion, mass movement, soil texture, permeability, carrying capacity, the potential for swelling, rock outcrops, and the depth of the groundwater table.

The data processing and analysis stage begins with processing Landsat imagery data, including cropping, geometric correction using the image-to-image method, radiometric correction using an algorithm formula for minimum and maximum band values, and classifying actual land use based on maximum likelihood. The next stage, the reinterpretation of the entire data based on a tiered approach, is used to determine land suitability from the scoring results by adding up the total values of all parameters.

The number of land suitability classes for settlements is grouped into four classes. For suitability classes that are very suitable for class I, for class II, not for class III, and very suitable for class IV determination of land suitability classes for settlements by providing an assessment and rating of all parameters using the formula: I = (CB)/K, where I = class range, c = highest vowel value, b = lowest vowel value, and k = desired class value (H. Wang et al., 2021).

In assessing each parameter in a land unit, consider the limiting factors that may become obstacles in settlement development activities. Limiting factors and evaluation activities on the suitability of settlement land in development planning can determine the actions and treatments needed for these land units. Furthermore, in determining the priority of settlement development in Ambon City, the resulting land suitability map of these parameters is overlaid with the actual (existing) land use map to obtain a priority map of settlement development.

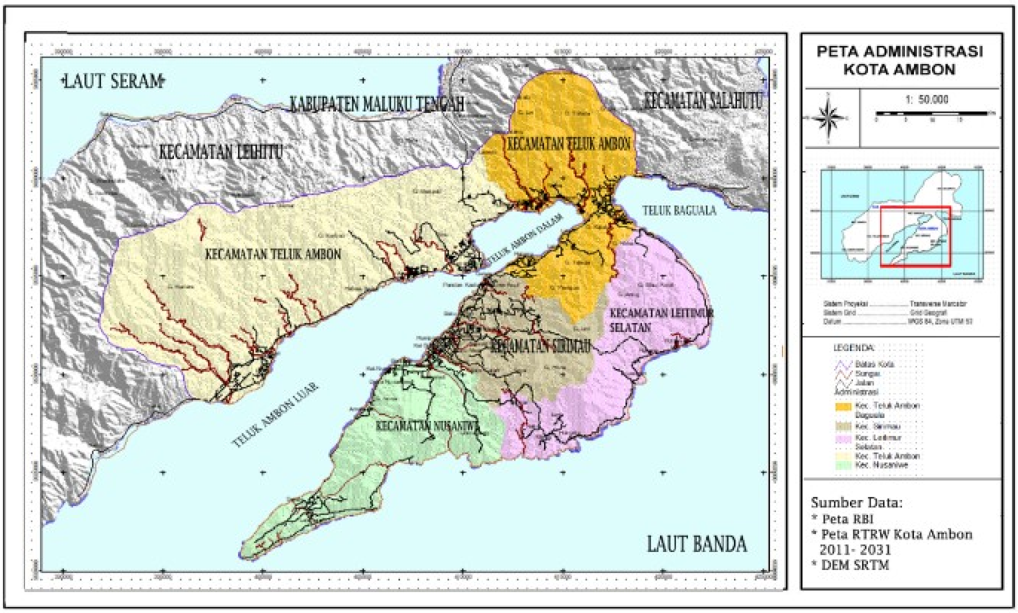

Figure 1. Ambon City Administration Map

RESULTS AND DISCUSSION

Image Correction for Actual Land Use Classification

Landsat 8 image data processing in 2022 begins with cropping in the study area. Then the geometric correction process uses 15 points from the ground control point, or GCP, based on the image-to-image correction from previously corrected satellite imagery. The results obtained from the RMS error value on Landsat satellite imagery with a resolution of 30 meters obtained a value of 0.082, indicating that the overall data is less than 0.5 and that the geometric correction results meet the requirements for further processing.

For radiometric correction, the uncorrected image has a digital number value of 0 to 65536 based on a 16-bit binary value. In contrast, the corrected image shows the value of the histogram with a range of different values in each band, which is the reflectance value.

The values obtained from the radiometric correction of Landsat 8 imagery show that the minimum value for each channel m has not shown the number 0. In contrast, the maximum value shows a value that is greater than one, so a correction needs to be made using an algorithmic formula to change the minimum and maximum band values. Change the band's minimum and maximum value using the following algorithm (b1 le 0): *0 + (b1 ge ten thousand) *1 + (b1 gt ten thousand and b1 lt ten thousand) *float (b1) / ten thousand. The radiometric correction value of Landsat 8 imagery after the correction algorithm is carried out is m 0, and the maximum value is m 1. Hence, the result value for each radiometric correction band was right.

It is, furthermore, classifying actual land use based on maximum likelihood as a classification method. Overall accuracy indicates the percentage of well-classified pixels. The accuracy of the classification method is 91.39 percent, with a Kappa coefficient of 95percent. Moreover, the results of the classification and spatial distribution of land use are shown in Table 1.

Tabel 1. Identification of actual Land Use Classes in 2022

Land Use	Area	Percent
Settlements and built-up land	5,923,844	18.40
Forest	7875,105	24.46
Mixed Garden	9.355, 778	29. 06
Plantation	6132,103	19.05
Moor	1476.51	4.59
Shrubs	1,428,821	4.44
Total area	**32,068,753**	**100.00**

Source: Data Analysis Results, 2022

Research Area Land Unit

The description of land units is based on three main elements, namely slope, landform, and land use. This classification is used as a parameter of land suitability. Vendors are mostly found on alluvial plains, lightly eroded denudational hills, and moderately eroded terrain. For settlements with a 10percent slope, moderately eroded denudational hill land units are used. The advantage of settlements in this land unit is that most people use the land for plantations as a source of income, such as cloves or other fruits such as durian, mango, langsat, nutmeg, and rambutans.

Land Suitability Class for Settlements

Landform units of fluvial origin consist of two landform units and three land units. The land units in the lowland alluvial landform unit consist of three land units, namely F1 I Pm and F1 I Tn. Based on the grading of the parameters of the three land units, the number of vowels for F1 I Pm is 29, and for F1 I Tn is 28, so these two land units are classified as very suitable for settlements. The land unit in the swamp landform consists of 1 land unit, namely F7 I Hb. Based on the harakat, the number of vowels is 20, which is classified as a class unsuitable for settlements.

Landform units of denudational origin consist of 3 landform units and 13 landform units, respectively. The land units contained in the lightly eroded denudational hill landform unit consist of 4 land units, namely D1 I Pm, D1 I Kc, D1 I Pk, and D1 I Sb. The land units in the moderately eroded denudational hill landform consist of five land units, namely D2 II Pm, D2 II Kc, D2 II Pk, D2 II Sb, and D2 II H. The Strong eroded denudational hill landform contains four land units: D3 III Kc, D3 III Pk, D3 III Sb, and D3 III H. H is 16, so this land unit belongs to a class that is unsuitable for settlements. Landform units of solution origin consist of 1 landform unit and 2 land units, of which the land units in the escarpment landform units are spread over land units, namely S7 III Sb and S7 III H. This land unit is classified as very unsuitable for settlement.

Land suitability criteria Settlement

Evaluation predicts potential land use based on predicted environmental degradation to determine a necessary planning policy. Table 2 shows the fundamental analysis of land classes for settlements in the study area, categorized into 4 (four) land suitability classes, namely very suitable, suitable, not suitable, and very unsuitable. Then, the following is a description or explanation of the level of suitability of each land unit for settlements:

Out of the 18 land units that were looked at, two were rated as being very good for settlements. The very suitable land units are found in fluvial landforms, with a total area of 3181.34 acres or 8.04percent categorized as very suitable for settlements. Thus, of the area of land that is very suitable for settlements, with a land area of 3 181.34 acres of the total area of Ambon City (37716.19 acres), the areas in the "very suitable" category include narrow areas of around 8.04percent, which are in plains areas. The majority of the coast has been occupied for settlement (7.43 percent) and moor use (0.61 percent).

There are five land units with suitable categories for residential locations in the research area out of the 18 land units evaluated. The total area of land units that are classified as suitable for settlements is 2852.05 acres, or 7.57 percent. Based on the description above, the Ambon City area is 377.19 acres, and the land suitable for residential development is 2,852.05 acres, or 7.57 percent. The sites in the appropriate category are scattered in hilly regions with slightly sloping relief and slope variations of 5percent to 8percent, and those occupied for settlements are 1.04 percent.

Five land units were unsuitable for residential locations in the study area out of the 18 units evaluated. The land units categorized as not ideal for settlement had a total area of 8237.89 acres, or 21.84 percent. Inappropriate land with an area of 8237.89 acres is mainly scattered in hilly regions with sloping relief and moderate erosion intensity. There is a danger in mass movement. Seven land units were not suitable for residential locations in the study area out of the 18 land units evaluated. The land unit categorized as "very unsuitable" is found in a landform of denudational origin with a total area of 37716.19 acres, and around that, 62.55 percent or most of the land is not suitable for settlement development; the remaining 7.45 percent is either very suitable, suitable, or not suitable.

Table 2. Class of Land Suitability for Settlements

Land Suitability Class	Land Unit	Wide	
		(Ha)	(percent)
Very suitable	F1 I Pm	2949,68	7,43
	F1 I Tn	231.66	0.61
Suitable	D1 Pm	390.95	1.04
	D1 I Kc	567.98	1.51
	D1 I Pk	1809.58	4.80
	D1 I Sb	83.54	0.22
Not suitable	D2 II Pm	1543.75	4.09
	D2 II Kc	1837,12	4.87
	D2II Pk	4843.79	12.84
	D2 II Sb	13,23	0.04
	F7 I Hb	204,19	0.54
Very unsuitable	D2 II H	1467,81	3.89
	D3 III Kc	3645.95	9.67
	D3 III Pk	9506.10	25,20
	D3 II Sb	347,32	0.92
	D3 III H	7787,76	20.65
	S7 III Sb	229.97	0.61
	S7 III H	403.38	1.07

Source: Data Analysis Results, 2022

Obstacle factor

The classification of inhibiting factors in the development of settlements in Ambon City is based on the parameters of land characteristics, which are the benchmark for assessing the level of land suitability as a measure in prioritizing the utilization of specific land uses. For this reason, more details can be seen based on Table 3 as follows:

Table 3 shows that the obstacle factor with poor inhibition conditions used in the endurance class could be more suitable for training with terrain units. D3 III Kc, D3 III Pk, D3 III Sb, D3 III H, S1 III Sb, and S1 III H This land unit in the study area has steep to very steep relief with steep terrain conditions. Hence, it is unsuitable for settlement development, in which the slope parameter is closely related to the vulnerability of the erosion process that occurs, which takes place intensively. Besides, it is prone to mass movements. Hence, the limiting factor is that this slope does not allow the development of settlements, which can automatically cause unwanted impacts such as landslides. Inhibiting factors with inundation parameters and poor conditions have very unsuitable suitability classes, namely the F7-1 Hb land unit. because it always experiences flooding, either caused by rain or an overflow of river water. The course needs to be more consistent with this inundation parameter and cannot be developed as a settlement location with the narrow land limitations in Ambon City. Inhibiting factors with erosion parameters show poor conditions and are spread over unsuitable land suitability classes, namely D3 III Sb, D3 III H, S7 III Sb, and S7 III H. On steep slopes, erosion will occur intensively, and the soil will be destroyed. Gradually, this will have fatal consequences for the condition of the building. In turn, cracks can occur due to the transport of the topsoil, making it very unsuitable for settlement development activities.

Soil texture is one of the obstacles to the development of settlements. The surface of sandy clay that dominates this land unit shows symptoms of low plasticity with poor water absorption, so it needs handling in making canals to minimize the impact of water erosion during the rainy season and maintain the stability of building foundations.

Table 3. Land Barrier Factors in Settlement Development in Cities

Obstacle factor	Condition Obstacle	Land suitability	Shape Unit	Code
Slope	Bad	Very unsuitable	Strongly Eroded Denudational Hills	D3 III Kc
			Strongly Eroded Denudational Hills	D3 III Pk
			Strongly Eroded Denudational Hills	D3 III Sb
			Strongly Eroded Denudational Hills	D3 III H
			Fault scarps	S7 III Sb
			Fault scarps	S7 III H
puddle	Bad	Very unsuitable	Swamp	F7 I Hb
Erosion	Bad	Very unsuitable	Strongly Eroded Denudational Hills	D3 III Kc
			Strongly Eroded Denudational Hills	D3 III Pk
			Strongly Eroded Denudational Hills	D3 III Sb
			Strongly Eroded Denudational Hills	D3 III H
			Fault scarps	S7 III Sb
			Fault scarps	S7 III H
Mass Movement	Bad	Very unsuitable	Strongly Eroded Denudational Hills	D2 II H
			Strongly Eroded Denudational Hills	D3 III Pk
			Strongly Eroded Denudational Hills	D3 III Sb
			Strongly Eroded Denudational Hills	D3 III H
			Fault scarps	S7 III Sb
			Fault scarps	S7 III H
Texture	Bad	Inappropriate	Strongly Eroded Denudational Hills	D1 I Pm
			Strongly Eroded Denudational Hills	D1 I Kc
Soil bearing capacity		Very unsuitable	Swamp	F7 I Hb
			Strongly Eroded Denudational Hills	D3 III H
			Fault scarps	S7 III Sb
Wrinkles	Bad	Very unsuitable	Strongly Eroded Denudational Hills	D3 III Kc
			Strongly Eroded Denudational Hills	D3 III Pk
			Strongly Eroded Denudational Hills	D3 III Sb
			Strongly Eroded Denudational Hills	D3 III H
			Fault scarps	S7 III Sb
			Fault scarps	S7 III H

Source: Results of Data Processing, 2022

Inhibitors of soil texture with poor conditions in the suitability class are not very suitable and are scattered over land units H D1 I Pm D1 I Kc. Soil texture is one of the obstacles to the development of settlements. The surface of sandy clay that dominates this land unit shows symptoms of low plasticity with poor water absorption, so it needs handling in making canals to minimize the impact of water erosion during the rainy season to maintain the stability of building foundations. One of the challenges in settlement development activities is a lack of soil carrying capacity in a very unsuitable category. It is spread over land units

F7 I Hb, D3 III H, and S7 III Sb. Soil carrying capacity provides the strength or ability of the soil to withstand the load of the building foundation from collapsing due to shear failure, which can be fatal for the settlers who occupy the location of the land

Soil wrinkled with poor conditions falls into the wrong category and becomes an obstacle to developing settlements. On land units, D2 II H, D3 III Kc, D3 III Pk, D3 III Sb, D3 III H, S7 III Sb, and S7 III H Corrugated flowers Durability of the building depends on the soil's ability to hold the foundation and walls of the building so they don't crack. Hence, construction work is challenging; land with many exposed outcrops could be more suitable for settlement development.

The inhibiting factor associated with the parameter of the depth of the groundwater table in poor conditions with a very unsuitable suitability class is the land unit F7-1 Hb. Due to inundation, both caused by rain and the overflow of river water, shallow groundwater levels have resulted due to water saturation in this land. This class needs to be more consistent with the parameters of the depth of the groundwater table. It cannot be developed as a settlement location with the narrow land limitations in Ambon City. land suitability for settlements at the study site, as presented in Figure 3.

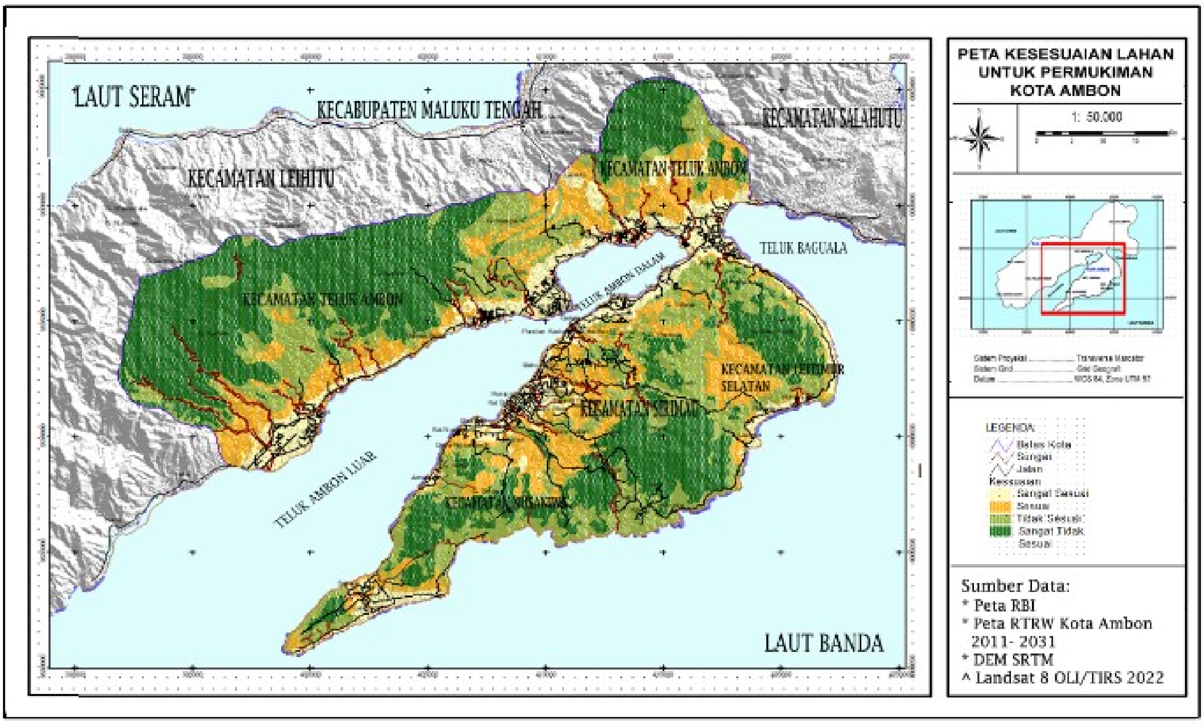

Figure 3. Land Suitability Map for Settlements in Ambon City

Development Priority

Based on the Ambon City land use map, in 2020, the land used for residential locations was 4884.3 acres, or 12.56 percent of the total area of Ambon City. The results of the map analysis show that the existing settlements occupy three land units. The details of each of these land units are land units that are categorized as very suitable, namely F1 I Pm land units with an area of 2949.68 acres, or 7.43 percent. classified as suitable, namely D1 I Pm land units with an area of 390.95 acres or 1.04 percent, and land units that were classified as unsuitable, namely D2 II PM land units with an area of 1543.75 acres or 4.09 percent. More details regarding settlement conditions based on suitability classes in the study area are presented in Table 4. Based on the Ambon City land use map for 2020, the land that has yet to be used for residential locations is 32752.68 acres or 86.84 percent of the total area of Ambon City. The results of the map analysis show that sites that have not been occupied as settlement locations occupy 15 land units. The details for each of these land units are land units categorized as very suitable, namely F1 I Tn land units with an area of 1.66 acres or 0.61 percent. The spatial Priority of settlement development in the research location is presented in Figure 4.

Table 4. Existing Settlement Area

Conformity Class	Land Unit	Wide	
		(Ha)	(percent)
Very suitable	F1 I Pm	2949,68	7,43
Suitable	D1I Pm	390.95	1.04
Not suitable	D2 II Pm	1543.75	4.09

Source: Results of Data Processing, 2022

Figure 4. Map of Settlement Development Priorities in Ambon City

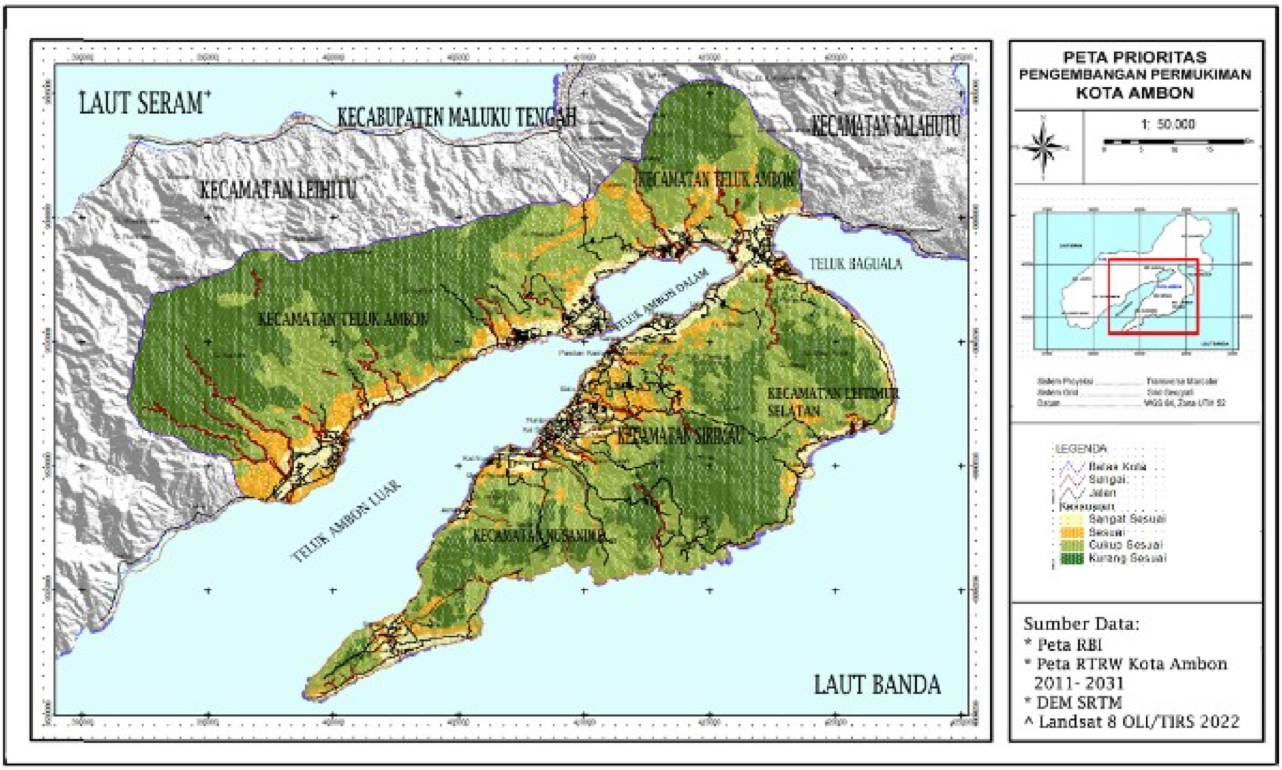

Table 5. Area of unoccupied settlements

Conformity Class	Land Unit	Wide	
		(Ha)	Percent
Very suitable	F1 I Tn	231.66	0.61
Suitable	D1 I Kc	567.98	1.51
	D1 I Pk	1809.58	4.80
	D1 I Sb	83.54	0.22
	D2 II Kc	1837,12	4.87
Not suitable	D2II Pk	4843.79	12.84
	D2 II Sb	13,28	0.04
	F7 I Hb	204,19	0.54
	D2 II H	1467,81	3.89
Very unsuitable	D3 III Kc	3645.95	9.67
	D3 III Pk	9506.10	25,20
	D3 III Sb	347,32	0.92
	D3 III H	7787,76	20.65
	S7 III Kc	229.97	0.61
	S7 III Pk	403.38	1.07

Source: Results of Data Processing, 2022

Furthermore, for priority development, the Priority I category consists of land units F1 I Pm and F1 I Sb, Priority II on land units D1 I Pm, D1 I Kc, D1 I Pk, and D1 I Sb, and Priority III on land units D2 II Kc, D2 II Pk, and D2 II Sb. Settlement development priorities in the research locations are presented in Table 6. From Table 6, it can be seen that settlements are being developed on unsuitable land units (D2 II PM) with an area of 204.19 acres. condition of Ambon City, which is primarily a hilly area (89 percent), thus making hilly areas the leading destination for residents for various activities, especially the need for residential land, which has an impact on land use that is not due to its suitability. With the development of settlements on unsuitable land units, local governments need to limit these various activities by carrying out protection, especially in protected areas, and by establishing strict regulations so people do not build illegally.

The government's firmness is intended to ensure the land's sustainability for future generations and to protect it from potential impacts such as landslides. Therefore, this policy can eliminate various damages to the ground resulting from excessive population exploitation as well as demands for land.

Table 6. Priority for Settlement Development

Kes Class	Priority	Land Unit	Wide (Ha)	Percent
Very suitable	Priority I	F1 I Pm	2949,68	7,43
		F1 I Tn	231.66	0.61
Suitable	Priority II	D1 I Pm	390.95	1.04
		D1 I Kc	567.98	1.51
		D1 I Pk	1809.58	4.80
		D1 I Sb	83.54	0.22
Not suitable	Priority III	D2 II Pm	1543.75	4.09
		D2 II Kc	1837,12	4.87
		D2II Pk	4843.79	12.84
		D2 II Sb	13,28	0.04
Very unsuitable	Not Priority	F7 I Hb	204,19	0.54
		D2 II H	1467,81	3.89
		D3 III Kc	3645.95	9.67
		D3 III Pk	9506.10	25,20
		D3 III Sb	347,32	0.92
		D3 III H	7787,76	20.65
		S7 III Kc	229.97	0.61

Source: Results of Data Processing, 2022

CONCLUSION.

Based on the results of the research and discussion, several conclusions can be put forward as follows. Land units in Ambon City consist of 18 land units based on overlapping landform maps, slope maps, and land use maps for evaluating land suitability for settlements. The majority of them are dominated by denudational landforms covering 33292.08 acres and fluvial landforms covering 3706.23 acres. in contrast, structural landforms with an area of 7.16 land suitability classes for settlements in Ambon City consist of 4 courses. The suitability categorized as very suitable is 3181.34 acres (8.04 percent), and the appropriate type is 567.98 ha (1.51 percent).

Inhibiting factors for developing settlements in the study area include steep slopes. They are also linked to high-risk mass movement factors, poor soil texture classes, low soil carrying capacities, intensive erosion processes, high soil swells, and outcrops that are more than 50% rock and have a shallow groundwater table. Priority development for settlements in Ambon City is aimed at very suitable, suitable, and not suitable categories consisting of 10 land units consisting of 11 land units, namely F1 I Pm, F1 I Tn, D1 I Pm, D1 I Kc, D1 I Pk, D1 I Sb, D2 II Pm, D2 II Kc, D2 II Pk, and D2 II Sb, with an area of 6077.9 1 acres or 16.11 percent.

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