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CARRYING CAPACITY OF SETTLEMENTS IN MEDAN PERJUANGAN SUB-DISTRICT

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ABSTRACT

Research in Medan Perjuangan Sub-District is being conducted in order to assess the settlements' current capacity for population growth. Medan Perjuangan sub-district has the greatest population density in Medan, with 25,533 persons per square kilometer. In 2021, the District of Medan Perjuangan will have a total population of 104,432 people, occupying an area calculated by ArcGIS to be 462.47 hectares. As the population in Medan Perjuangan Sub-District grows, so will the demand for housing. While the land is fixed, it will encourage the development of new land uses. For data gathering, the study relied on field observations and documentation. The data is analyzed using a quantitative and geographical approach. There has been a shift in land use in Medan Perjuangan Sub-District, with 5.76 hectares of undeveloped land now serving as a function of communities and sites of activity, according to the results of satellite image interpretation. As a result, there has been an increase in settlements and centers of activity to 451.74 hectares, or 97.67 percent. The Medan Perjuangan Sub-District has a class C land capability with medium development ability and class D with moderate development ability, according to the results of the calculation of the land capability unit. According to settlement capacity calculations, the Medan Perjuangan Sub-District cannot satisfy the needs of settlements with DDP 1 anymore. Those involved in the planning of future development in the Medan Perjuangan Sub-District will find this study to be an important resource.

KEYWORDS: Carrying Capacity, Density, Land Capability, Settlement

1. INTRODUCTION

Development is a social process that is planned or engineered in which the development aims to overcome the problems that arise due to population growth. Population growth basically requires land as a place of life, in this case settlements [1]. Land is a form of the earth's surface in which it consists of natural resources that cannot be developed for their use. Land cannot be developed. In a regional spatial plan, settlements and housing show the dominance of development and development that is difficult to control both in urban and rural areas. The increasing number of residents which will then increase the need for new settlements will cause a decrease in productive land due to changes in land use for settlements and housing [2].

Medan's growing population and high demand for housing necessitates additional land for building and construction [3]. [4] Medan Perjuangan sub-district has the city's highest population density, at 25,533 persons per square kilometer. According to ArcGIS, Medan Perjuangan District will have a population of 104,432 people in 2021, with an area of 462.47 Ha [4]. The district of Medan Perjuangan may see a rise in housing demand due to the city's burgeoning population. While the land is fixed, it will encourage the development of new land uses. Settlement and commerce zones were the most common uses of the land at the time. At 70%, the spatial plan and current land use were compatible. The open green space has a very small area, which shows land use deviations from spatial planning. The green space that had been planned in spatial designs was used by the residential area [5].

The physical aspect, namely the topography of the region, is one of the dominant factors that causes differences in development patterns in each region. Based on data from the Medan Perjuangan District in Figures for 2021, the Medan Perjuangan District is mostly located on a slope of 2-5% and 5-15% [5]. Areas with relatively flat slopes are used as cultivation areas and are urban development areas.

The Medan Perjuangan District may be able to reduce its carrying capacity as a result of population growth and new settlements, given the preceding issues. When the land's carrying capacity diminishes, so does the quality of the environment. The establishment of slum communities is one of the issues that can be caused. Sei Kera Hulu Village and Kelurahan Sei Kera Hilir II are two slum settlement points in Medan Perjuangan District, which are based on the RP2KPKP document (Plan for Prevention and Improvement of the Quality of Urban Slums) of Medan City and SK Walikota Medan City Number 640/06.K/XII/2020.[6]. As a result, figuring out how to regulate the conditions of the District of Medan Perjuangan's carrying capacity of settlements is essential for preventing settlement growth and development. As a measure of an area's carrying capacity, we look at how much land an area has available to build settlements that can house its current people comfortably. Because it may be used to anticipate alternative possibilities and the degree of population demand in light of current land circumstances [7], knowing a land's carrying capacity is critical for a development planner. If the land's carrying capacity value exceeds a certain level, the population in that area has outgrown the area's ability to support them.

2. Object, Research Area, and Research Method

2.1 Object and Research Area

The goal of this study is to find out how much residential land in the Medan Perjuangan District, where the study is taking place, can hold.

2.1.1 Medan Perjuangan Sub-District

Medan, North Sumatra Province, is where the research is taking place. The city of Medan covers 265.10 square kilometers, or 26.510 hectares. At a height of 2.5 to 3.7 meters above sea level, Medan City is located in the vicinity of 30.27'-30.47' North Latitude and 98.035'-98.044' East Longitude in

Indonesia. These are Medan's administrative boundaries: The Strait of Malacca is on the north side. It includes the Medan and Pancur Batu districts of Deli Serdang Regency to its south, Sunggal to its west, and Percut to its east. [8].

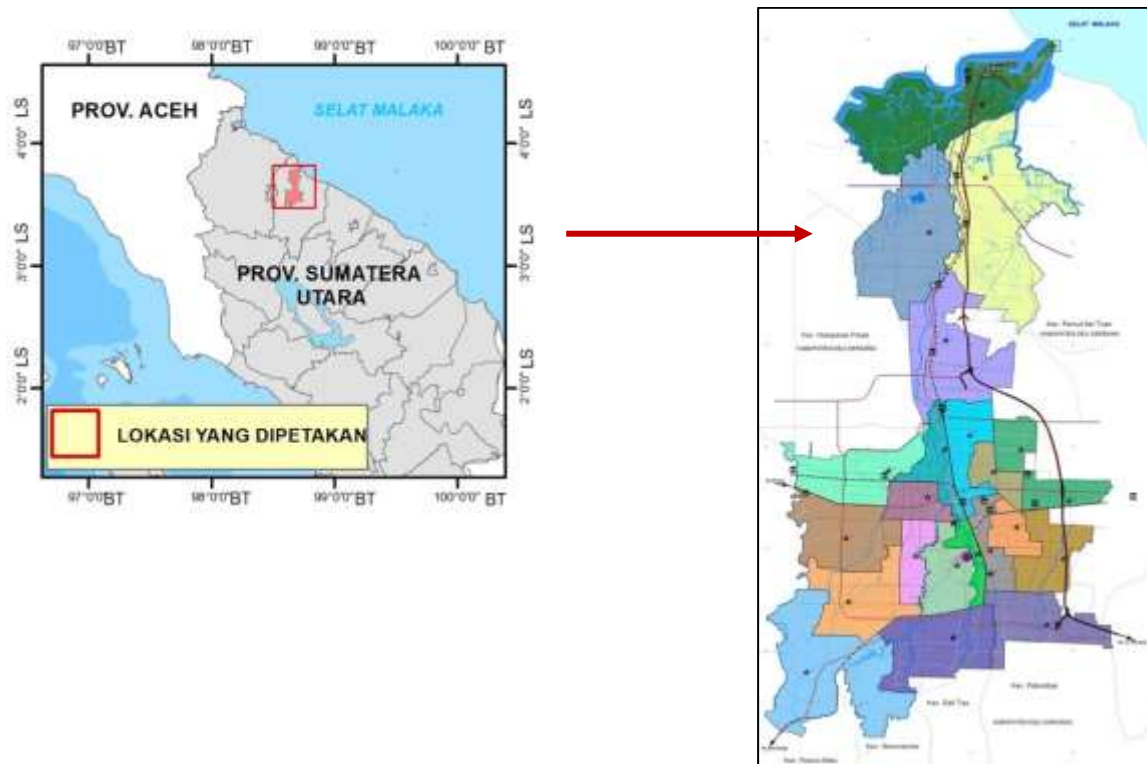


Figure 1: Map of Medan City

The Babura River and the Deli River meet in the lowlands of Medan City, which makes up the majority of the city. The city of Medan has a tropical climate, with a minimum temperature of 21^oC and a high temperature of 36^oC in 2020, according to the Sampali Station. 82 percent of the air is humid, with an average wind speed of 1.16 meters per second and a total monthly evaporation rate of 117.5 millimeters. Medan City receives an average of 228.5 millimeters of rain each month.[9].

Table 1. Area per Sub-District in Medan City

No	Sub-District	Sub-District Area (Km ²)	Altitude of The Area
1	Medan Tuntungan	20.68	56
2	Medan Johor	14.58	41
3	Medan Amplas	11.19	35
4	Medan Denai	9,05	25
5	Medan Area	5.52	26
6	Medan Kota	5.27	27
7	Medan Maimun	2.98	28
8	Medan Polonia	9.01	30
9	Medan Baru	5.84	31
10	Medan Selayang	12.81	32
11	Medan Sunggal	15.44	28
12	Medan Helvetia	13.16	28
13	Medan Petisah	6.82	26
14	Medan Barat	5.33	20
15	Medan Timur	7.76	20
16	Medan Perjuangan	4.62	18
17	Medan Tembung	7.99	20
18	Medan Deli	20.84	13
19	Medan Labuhan	36.67	6
20	Medan Marelan	23.82	4
21	Medan Belawan	26.25	5
Total		165.10	-

Medan Perjuangan District is one of the sub-districts in Medan City with an area of 4.62 Km² or 462.47 Ha. Medan Perjuangan District is located at 030-320 North Latitude and 980-470 East Longitude. Located at an altitude of 25 meters above sea level. The administrative boundaries of the area are as follows: North side: Medan Tembung and East Medan Districts; To the South: Medan Area and Medan City Districts; West side: East Medan; East side: Medan Tembung District.

The Medan Perjuangan sub-district consists of 9 villages, namely Pandau Hilir Village, Sei Kera Hulu Village, Pahlawan Village, Sei Kera Hilir Village I, Sei Kera Hilir Village II, East Sidorame Village, West Sidorame II Village, West Sidorame I Village, and Tegal Rejo Village. The kelurahan with the largest area is Kelurahan Tegal Rejo, which is 104.39 ha, while the kelurahan with the smallest area is Kelurahan Sei Kera Hilir II, which is 32.65 ha (Table 2).

Table 2. Area of Sub-Districts per Village

No	Villages	Villages Area (Ha)
1	Pandau Hilir	52,69
2	Pahlawan	42,15
3	Sei Kera Hulu	28,46
4	Sei Kera Hilir II	32,65
5	Sei Kera Hilir I	58,21
6	Sidorame Timur	41,14
7	Sidorame Barat II	54,18
8	Sidorame Barat I	48,61
9	Tegal Rejo	104,39
Total		462,47

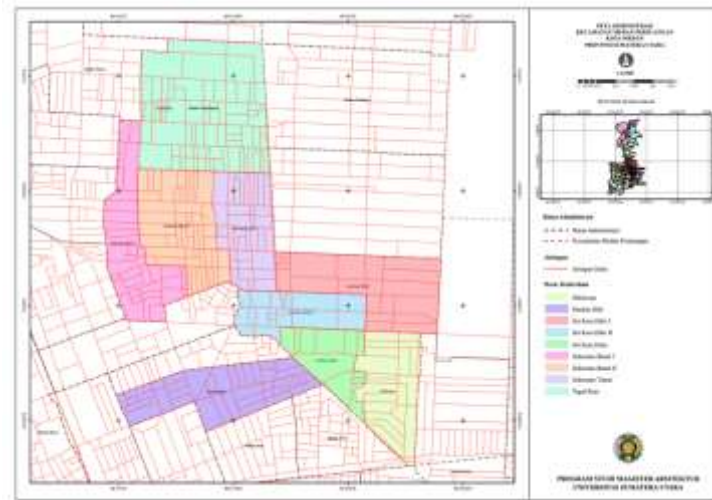


Figure 2: Map of Medan Perjuangan Sub-District

In Medan Perjuangan District, there are 6 land use classifications, namely roads, settlements and places of activity, public cemeteries, plantations/gardens, shrubs, and rivers. Table 3 provides further information:

Table 3. Land Use in Medan Perjuangan Sub-District

No	Land Use	Land Use Classification	Area (Ha)
1	Public cemetery	Non-Built-up Land	2,25
2	Plantation / Garden		1,03
3	Shrubs		0,69
4	River		2,66
5	Road	Built-up Land	4,09
6	Settlements and Activities		451,74
Total			462,47

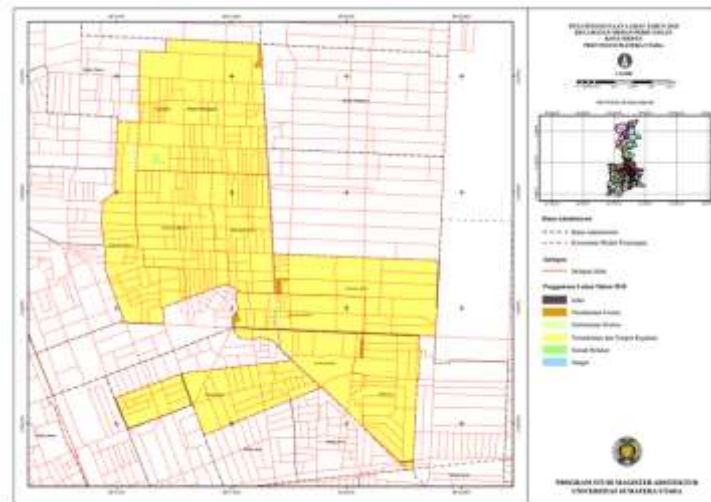


Figure 3: Land Use in Medan Perjuangan District

For settlements and other places of activity, 451.74 hectares (97.67 percent of the total area) of Medan Perjuangan District can be seen in the table above, which shows that the most extensive use of land is for this purpose. 0.15 percent of the sub-district is covered by 0.69 hectares of bushes, which is the smallest land use.

2.2 Research Method

The author employs descriptive research to report the results of the computation of the carrying capacity of residential land [10] in order to conclude this investigation. Calculation of land's carrying capacity based on Muta'ali's calculations (2012). Land area needed for space rationed by population 03-1733-2004 [11].

In this research, the location of the research is Medan Perjuangan District. Determination of this location is determined by the purposive method, namely the researcher chooses a research location based on consideration of reasons. The basis for choosing the location of this research is because Medan Perjuangan Sub-district is the sub-district with the highest density in Medan Perjuangan District with a population density per km² of 25,382.15 (Medan City in Figures in 2021) [9].

Based on problems and theoretical foundations, such as Minister of Public Works Regulation No. 20 of 2007 concerning Technical Guidelines for Analysis of Physical and Land Aspects, Economics and Socio-Cultural in the Preparation for Spatial Plans [12], the researcher determined the research variable [13]. The procedure for determining research variables is shown in the following table (Table 4):

Table 4. Methods of Determining Research Variables

Research Problems	Theoretical Basis	Variable
How is the carrying capacity of the land in the Medan Perjuangan District in 2022 to support the development of settlements?	1) Permen PU No. 20/PRT/M/2007 2) Pedoman Teknis Analisis Aspek Fisik dan Lingkungan	Land Capability 1) SKL Morfologi 2) SKL Kemudahan Dikerjakan 3) SKL Kestabilan Lereng 4) SKL Kestabilan Pondasi 5) SKL Ketersediaan Air 6) SKL Terhadap Erosi 7) SKL Untuk Drainase 8) SKL Pembuangan Limbah 9) SKL Terhadap Bencana Alam
	Perhitungan Daya Dukung Lahan Permukiman oleh Muta'ali (2012) Koefisien yang digunakan yaitu SNI 03-1733-2004 Maria, R. P., & Supardjo, S. (2018). Analisis Daya Dukung dan Daya Tampung Lahan di Kecamatan Malalayang Kota Manado	Land Carrying Capacity Settlement

There are 2 data collection techniques used by researchers. The first is a primary survey in the form of observation and documentation. Observations were carried out by visiting the research site directly in order to obtain accurate and factual data on the existing conditions accompanied by documentation in the form of photographs according to the data needed for research.

The second data collection technique is a secondary survey, namely by collecting existing data, whether published or not, from related agencies, from previous journals, as well as from online publications in the form of papers or books that are in accordance with the research discussion.

Table 5. Data Collection Method

Research Problem	Variable	Required Data	Data Collection Technique
How is the carrying capacity of the land in the Medan Perjuangan District in 2022 to support the development of settlements?	Land capability	1) Climatological Map 2) Topographic Map 3) Geological Map 4) Hydrology Map 5) Mineral Resource Map 6) Natural Disaster Map 7) Land Use Map 8) Tilt map 9) Morphological Map 10) Soil Type Map	Secondary Survey by collecting existing data from relevant agencies such as BMKG, Department of Agriculture, BPS, Bappeda, PU, and the Department of Energy and Mineral Resources of Medan City
	Land Carrying Capacity of Settlement	1) Built-up and non-built land 2) Land capability map	Secondary data collection by collecting data from relevant agencies such as BPS, BMKG, Department of Agriculture, Bappeda, PU, and the Department of Energy and Mineral Resources of Medan City

The population determination method used by the author in this study is the census method, which is the entire built-up area at the research location.

To analyze the carrying capacity of settlements in the Medan Perjuangan District, it is first necessary to calculate the land capability unit (SKL) by overlaying one map with another. This is useful for knowing the value of the appropriate land capability as a residential area which will then produce a land capability map in the Medan Perjuangan District. The application used is ArcGis. The following are 9 SKLs that need to be analyzed in Table 6.

Table 6. Data Analysis Techniques on Land Capability Units (SKL)

No	Type of Land Capability Unit (SKL)	Data Analysis Techniques
1	Land Morphological Capability Unit	Overlay between slope map and morphology map.
2	Land Capability Unit Ease of Work	Overlay data in the form of elevation maps, slope maps, and maps of soil types.
3	Land Capability Unit Slope Stability	Overlay data in the form of elevation maps, slope maps, and morphology maps.
4	Land Capability Unit for Foundation Stability	Overlay data in the form of elevation maps, slope maps, morphological maps, and maps of soil types.
5	Land Capability Unit for Water Availability	Overlay data in the form of watershed maps (Watershed Areas), rainfall maps, and land use maps
6	Land Capability Unit for Drainage	Overlay data in the form of elevation maps, slope maps, and rainfall maps.
7	Land Capability Unit for Against Erosion	Overlay data in the form of rainfall maps, maps of soil types, morphological maps, and slope maps.
8	Land Capability Unit for Waste Disposal	Overlay data in the form of elevation maps, slope maps, and rainfall maps.
9	Land Capability Unit for Natural Disasters	Overlay data in the form of elevation maps, slope maps, morphological maps, and maps of soil types.

From the results of the analysis of the land capability unit, the land development capability class in the Medan Perjuangan District will be obtained.

1) Land Development Capability

The goal of this study was to get a sense of the land's potential for sustainable urban development by using it as an example. As part of the following stage of land suitability analysis, land capability analysis is employed as a guide. The district of Medan Perjuangan's land development capability class can be determined using the findings of the land capability unit calculation.

2) Calculation of Settlement Carrying Capacity

Calculation of the carrying capacity of land using calculations according to Muta'ali (2015) [13], namely:

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

Information:

DDPm = Land Carrying Capacity of Settlement

JP = Population

α = Coefficient of space requirement/capita (m²/capita)

According to SNI 03-1733-2004 of 26 m², while according to the Regulation of the State Minister of Public Housing no. 11/PERMEN/M/2008, needs vary by region. The coefficient chosen by the researcher is SNI 03-1733-2004.

LPm = Adequate land area for settlement (m²), may use some limitations.

After obtaining the results from the DDPm, it can be clarified with the range of values for the settlement carrying capacity index as follows:

- If $DDPm > 1$, In other words, the settlement's carrying capacity is large, and it can still accept residents who want to live there (construct homes).
- If $DDPm = 1$, Carrying capacity means that the community can support a reasonable number of residents while maintaining its natural environment.
- If $DDPm < 1$, The settlement's carrying capacity has been reduced to the point where it can no longer absorb new residents.

3. DISCUSSION

3.1 Land Capability Unit (SKL)

In the analysis of the carrying capacity of the settlement, it is necessary to analyze the Land Capability Unit (SKL) which consists of 9 capability units. This analysis is useful for knowing the value of land capability that is suitable as a residential area which then produces a map of land capability in the Medan Perjuangan District. The next paragraph discusses the land capability analysis.

3.1.1 Land Morphological Capability Unit

In determining the SKL (Land Capability Unit) Morphology, an overlay will be made between the slope map and the morphological map.

Table 7. Land Capability Unit Morphology

No	Classification	Area (Ha)
1	Land Capability of Sufficient Morphology	187,61
2	Land Capability of Less Morphology	0,11
3	Land Capability of Moderate Morphology	24,82
4	Land Capability of High Morphology	249,93
Total		462,47

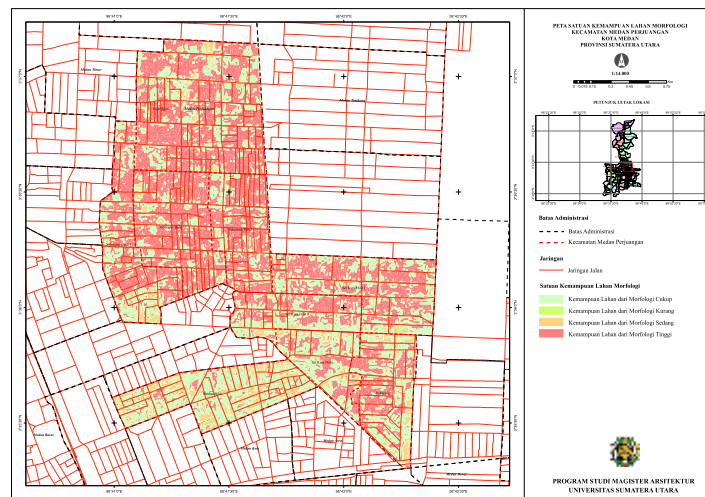


Figure 4: Land Morphological Capability Unit

High Morphological Morphological Classification In terms of overall land area, Land Capability has the most land with 249.93 Ha, or 54.04% of the total land area. By "morphology," we mean "landscape." There are no intricate topographies in a location with high land capability. As a result, the area is rather flat, making it an ideal location for both settlement and agricultural endeavors. This suggests that the morphological circumstances of a place are more complicated when land capability is limited. The scenery is rugged, mountainous, and undulating as a result of its complex morphology. Complex morphology makes it difficult or impossible to develop land. This type of land should be designated as a conservation area or farmed land.[14].

3.1.2 Land Capability Unit Ease of Work

In the SKL (Land Capability Unit) Ease of Work, there will be an overlay of elevation maps, slope maps, and maps of soil types.

Table 8. Unit of Land Capability Ease of Work

No	Classification	Area (Ha)
1	High Ease of Work	462,47
Total		462,47

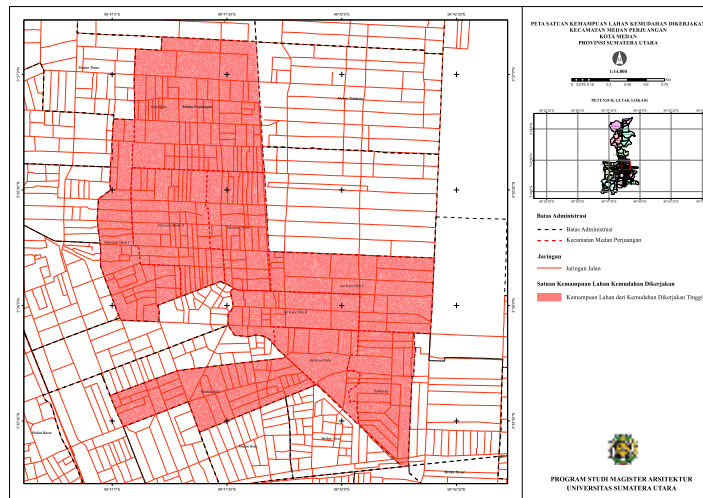


Figure 5: Land Capability Unit Ease of Work

The Ease of Work Land capability unit in the Medan Perjuangan District only has one classification, namely the High Ease of Work Classification covering an area of 462.47 Ha or 100%. The high ease of working on land means that the land in an area has the capability of land that is easy to work with so that the area is easy to be excavated/matured in the development process as well as in the area development process.

3.1.3 Land Capability Unit Slope Stability

In SKL (Land Capability Unit) Slope Stability, elevation maps, slope maps, and morphology maps will be overlaid.

Table 9. Land Capability Unit Slope Stability

No	Classification	Area (Ha)
1	Sufficient Slope Stability	354,02
2	Less Slope Stability	24,93
3	Medium Slope Stability	19,39
4	High Slope Stability	64,13
Total		462,47

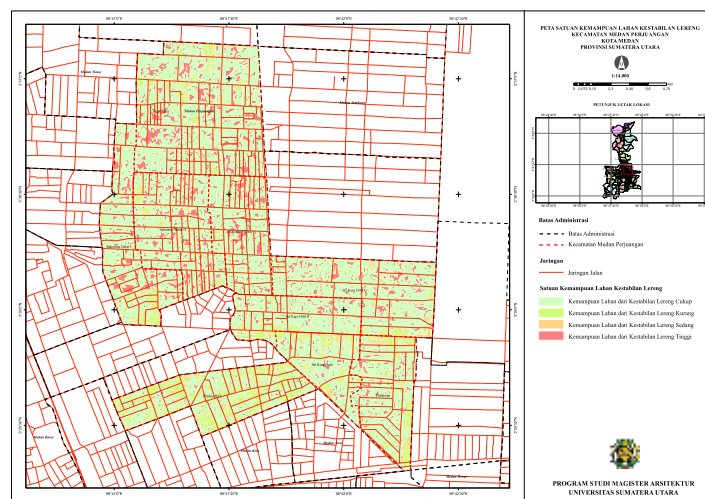


Figure 6: Land Capability Unit Slope Stability

Four classes are used in the Slope Stability Land Capability Unit (LCSU). The area with the highest Slope Stability Classification is 354.02 hectares. The slope of the land determines whether or not the area is stable in terms of its physical state. Slope stability indicates that a region is secure and stable enough to be used for developing towns and cultivating crops. Slope stability, on the other hand, indicates that the region is unstable and susceptible to landslides. Buildings and villages should not be constructed in areas with poor slope stability. Forests, plantations, and water catchment systems all thrive in areas with a low degree of slope stability.

3.1.4 Land Capability Unit for Foundation Stability

In the SKL (Land Capability Unit) Foundation Stability, an overlay of elevation maps, slope maps, morphological maps, and maps of soil types will be performed.

Table 10. Land Capability Unit for Foundation Stability

No	Classification	Area (Ha)
1	Sufficient Foundation Stability	44,21
2	Medium Foundation Stability	0,11
3	High Foundation Stability	418,15
Total		462,47

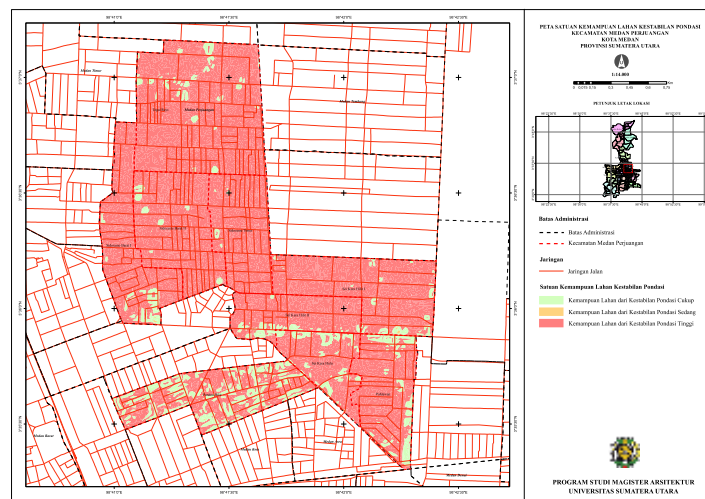


Figure 7: Land Capability Unit for Foundation Stability

The Land Capability Unit for Foundation Stability is divided into 3 classifications, with the High Foundation Stability Classification having the largest area of 418.15%. This means that 90.42% of the land in Medan Perjuangan District has a high foundation stability. The stability of the foundation means the condition of the land/area that supports the stability of a building or a built area. High foundation stability means that the area will be stable for any building foundation or for any type of foundation. Sufficient foundation stability means the area is quite stable. Meanwhile, moderate foundation stability means that this area is less stable, but it is possible for other types of foundations to be more stable, such as chicken claw foundations.

3.1.5 Land Capability Unit Water Availability

In the SKL (Land Capability Unit) for Water Availability, overlay maps of watershed maps (watersheds), rainfall maps, and land use maps will be carried out.

Table 11. Land Capability Unit Water Availability

No	Classification	Area (Ha)
1	Lack of Water Availability	462,47
Total		462,47

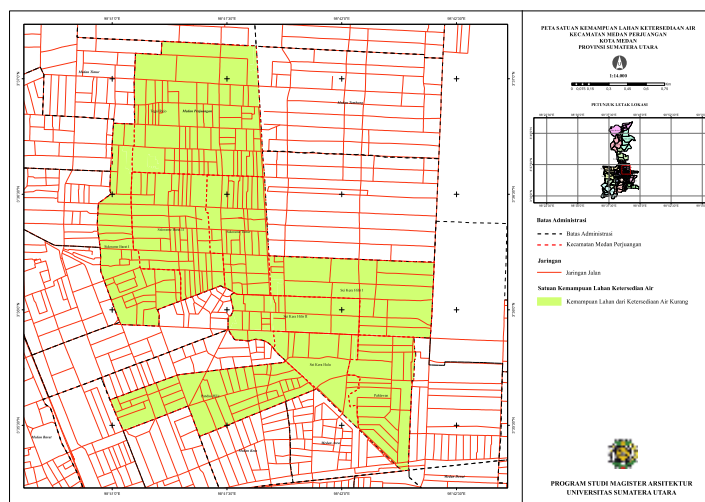


Figure 8: Land Capability Unit Water Availability

Medan Perjuangan District only has 1 land capability classification in the Water Availability SKL, namely Lack of Water Availability of 462.47 Ha or 100% of the total land area. Lack of water availability is an area that has very limited groundwater.

3.1.6 Unit of Land Drainage Capability

In SKL (Land Capability Unit) Drainage will be overlaid elevation map, slope map, and rainfall map.

Table 12. Unit of Land Drainage Capability

No	Classification	Area (Ha)
1	Sufficient Drainage Ability	398,24
2	High Drainage Capability	64,23
Total		462,47

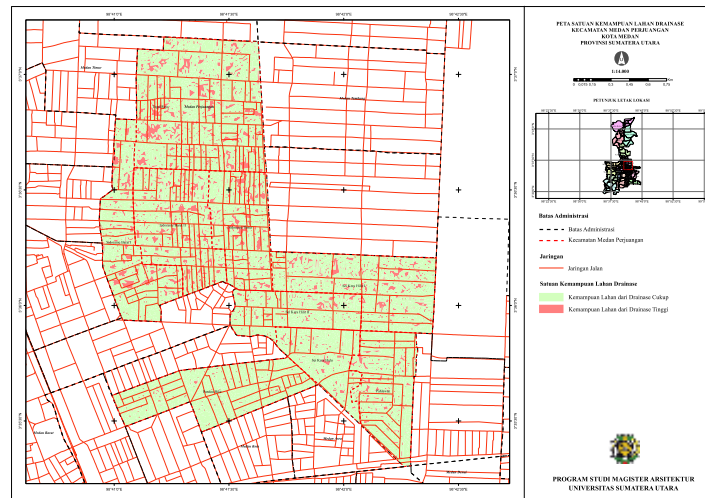


Figure 9: Unit of Land Drainage Capability

The Land Drainage Capability Unit, Medan Perjuangan Sub-district has 2 classifications with the Sufficient Drainage Capability having the largest area of 398.24 Ha. High drainage capability means that the water flows easily or flows smoothly. While the drainage capability is sufficient, it means that the drainage ability is smooth enough to stop rainwater.

3.1.7 Land Capability Unit Against Erosion

In the SKL (Land Capability Unit) for erosion, an overlay of rainfall maps, soil type maps, morphological maps, and slope maps will be carried out.

Table 13. Land Capability Unit Against Erosion

No	Classification	Area (Ha)
1	Enough Erosion	462,32
2	High Erosion	0,15
Total		462,47

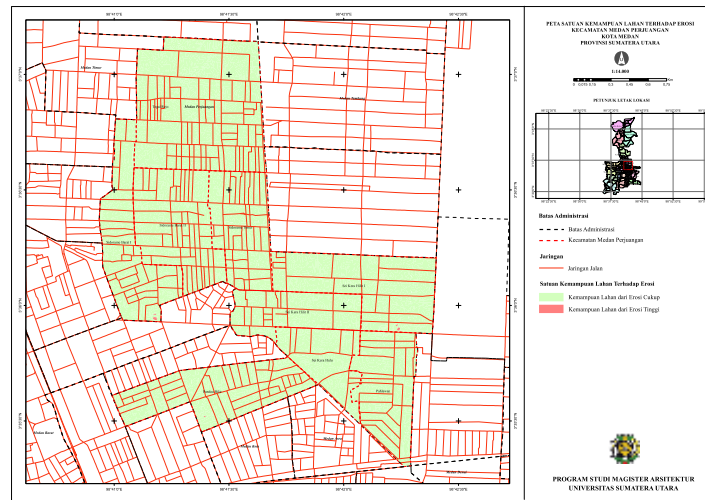


Figure 10: Land Capability Unit Against Erosion

The Enough Erosion Classification has a 99.97 percent classification in the Land Capability Unit for Erosion. If a layer of soil is swept away by water or wind, it is referred to as erosion. Eroding soil indicates that wind and water are easily able to carry away the top layer of soil. The soil layer is easily peeled off and carried away by wind and water if there is a high rate of erosion. Soil with a high erosional capacity can be easily swept away by wind and water.

3.1.8 Land Capability Unit for Waste Disposal

In SKL (Land Capability Unit) Waste Disposal will be overlaid with elevation maps, slope maps, and rainfall maps.

Table 14. Land Capability Unit for Waste Disposal

No	Classification	Area (Ha)
1	Less Land Ability for Waste Disposal	362,47
2	Land Ability For Low Waste Disposal	65,98
3	Land Capacity for Medium Waste Disposal	34,02
Total		462,47

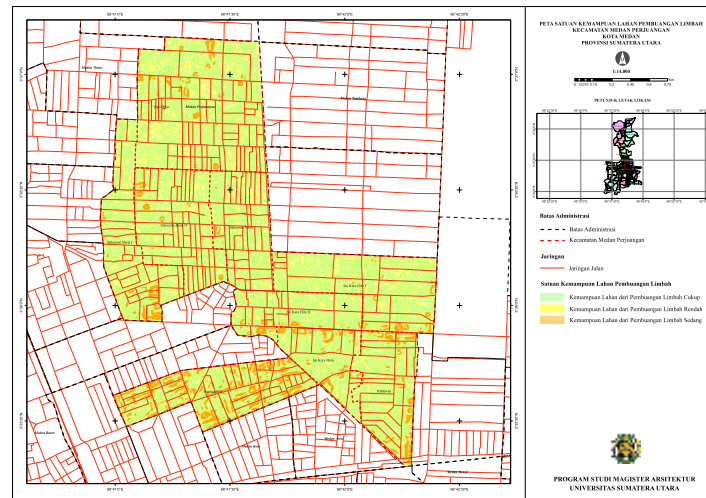


Figure 11: Land Capability Unit for Waste Disposal

The capacity of the waste disposal area in Medan Perjuangan District is divided into 3 classifications, namely the ability of the land to dispose of waste less, low, and moderate. The land capacity for waste disposal has the largest area, which is 362.47 Ha or 78.37%. The low category means that this area is not very suitable and unsupported for a waste disposal area, the low category means that this area is not suitable as a waste disposal area, and the medium category means that this area can be used as a waste disposal area but not for solid waste.

3.1.9 Natural Disaster Land Capability Unit

In the SKL (Land Capability Unit) for Natural Disasters, an overlay of elevation maps, slope maps, morphological maps, and maps of soil types will be carried out.

Table 15. Natural Disaster Land Capability Unit

No	Classification	Area (Ha)
1	Low Natural Disaster Potential	462,47
Total		462,47

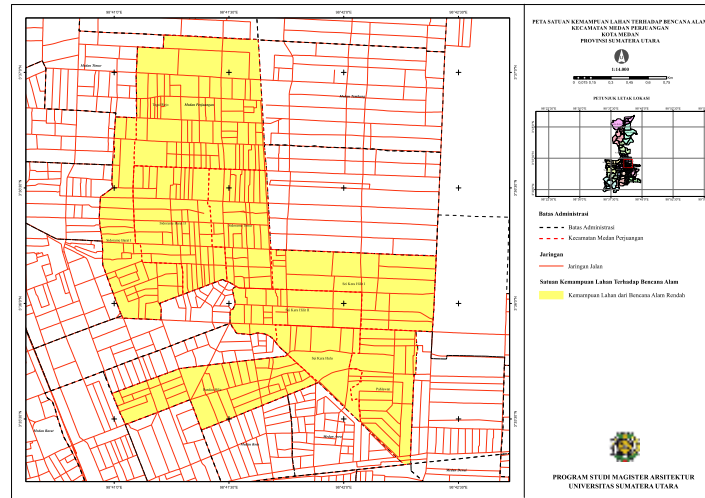


Figure 12: Natural Disaster Land Capability Unit

Medan Perjuangan District only has 1 category of land capability for natural disasters, namely the category of low natural disaster potential. The low natural disaster category is an area that is relatively safe from natural disasters. Based on the results of the overlay analysis by combining the nine variables of the Land Capability Unit (SKL) and multiplying the weights with the final value using the ArcGis application, it is obtained that the land development capability class in Medan Perjuangan District is divided into two (2) land capability classifications, namely Class C medium development capability and Class D Low development ability. The following is a map of land capability in the District of Medan Perjuangan (Table 16 and Figure 13):

Table 16. Land Capability of Medan Perjuangan Sub-District

No	Value	Land Ability Class	Development Classification	Area (Ha)	%
1	84 - 107	Class C	Medium Development Ability	212,53	45,96%
2	112 - 122	Class D	Slightly High Development Ability	249,94	54,04%
Total				462,47	100%

Table 17. Land Capability of Medan Struggle District per Village

No	Village	Area (Ha)	
		Class C	Class D
1	Pahlawan	23,46	18,68
2	Pandau Hilir	45,63	7,07
3	Sei Kera Hilir I	25,15	33,06
4	Sei Kera Hilir II	16,63	16,02
5	Sei Kera Hulu	18,08	10,37
6	Sidorame Barat I	20,69	27,91
7	Sidorame Barat II	14,15	40,03
8	Sidorame Timur	13,36	28,16
9	Tegal Rejo	34,99	69,01
	Total	212,14	250,31

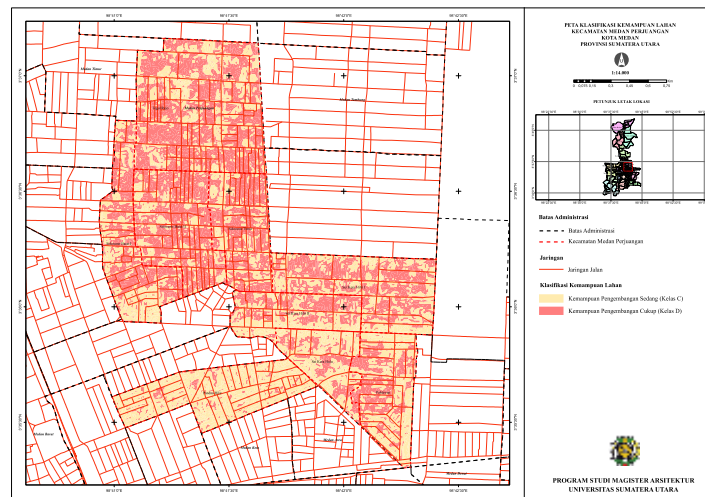


Figure 13: Land Capability of Medan Perjuangan Sub-District

Based on the results of the analysis, the land capability classification according to the Minister of Public Works No. 20 of 2007, then the Medan Perjuangan sub-district was included in class C, namely moderate development ability and class D, rather high development ability. Each kelurahan has a land capability classification of class C and class D.

a. Medium Development Land Capability (Class C)

Areas with moderate land capability are conditionally compliant areas, although they can be developed into urban areas (development), these areas have terms and conditions for their use. So that in the Medan District the struggle for land capability is being included in the buffer area because the ability

of this land has land use provisions that can be developed, namely with a maximum land cover ratio of 20% of the total area of the buffer area.

b. Slightly High Development Land Capability (Class D)

Areas with a rather high capacity for land development have a very suitable ability to be used as land for urban area development and do not have any physical obstacles in developing urban areas. Therefore, the Medan Perjuangan sub-district is strongly supported with a rather high development capability into a cultivation area as well as the development of service centers in urban areas with a maximum land cover ratio of 30%.

Result of Duwila and Tarore research (2019) the medium usage capability area (class C), which has a total size of 40669.919 Ha, is where the land capability is located in the largest region of space utilization. This demonstrates that 74.25 percent of Sulabesi Island's area is classified as Class C, which denotes that the land capability is considered to be moderate or classified as a medium usage region [15].

Based on the findings of the analysis by Sarita (2022) in each sub-district in North Halmahera Regency, it is evident that each sub-Land district's Capability Classification is dominated by a relatively high development capability (class d). With an area of 36951.58 hectares, West Kao District has the largest area of the dominant classification [16].

Research by Ridha (2016) findings of the overlay map of the land capability unit showed that the interval value is 33.8 and the land capability classes a, b, c, d, and e have a minimum value of 32 and a maximum value of 169. A categorization of land capability in the cultivation area for the construction of residential areas and urban supporting infrastructure was produced as a result of the overall analysis of land capability for development in the Mpunda District region: (a) Medium Development Capability refers to the ability of land that is less able to be developed or according to conditions if it will continue to be developed in Mpunda District. (b) Very High and High Development Capability refers to land that has good capabilities and is very suitable for the development of Mpunda District [17].

As Fachmi's research (2020) states that there are 4 classifications of land capability in the Wawo Urban Area, namely, Class E with a high development capability classification, class D with a moderate development capability classification, Class C with a moderate development capability classification, and Class B with a moderate development capability classification. lack of development capabilities. The ability to develop medium land development is an area according to conditions with a maximum development of 20% of the total area of the buffer area or an area of 1.99 Ha [18].

3.2 Carrying Capacity of Settlement

Calculating the carrying capacity of settlements using 3 calculation variables, namely the number of residents, the standard area of per capita needs, and the area of land for settlements. For more details, it can be seen in Table 5.13 below:

Table 18. Land Area for Settlement Development

No	Land Ability Class	Area (Ha)	Non-built Land Use	Area (Ha)	Available Area (Ha)	Maximum Land Cover (%)	Area Suitable For Development (Ha)
1	Class C	212,14	Public cemetery	1,48	X	20%	0,204
			River	1,93	X		
			Plantation/Gardens	0,59	1,02		
			Shrubs	0,43			
2	Class D	250,31	Public cemetery	0,77	X	30%	0,21
			River	0,73	X		
			Plantation/Gardens	0,44	0,70		
			Shrubs	0,26			
Total		462,47		6,63			0,414

The population of the Medan Perjuangan Sub-district in 2020 is 103,813 people with an area of 0.414 Ha or 4,140 m² of residential development land. From the calculation, it is found that the carrying capacity of settlements in Medan Perjuangan District is <1, with a value of 0.0015 so it can be concluded that the carrying capacity of settlements is no longer able to support the needs of settlements. The optimal number of residents in the District of Medan Perjuangan that can be accommodated is 155.72 people or 156 people.

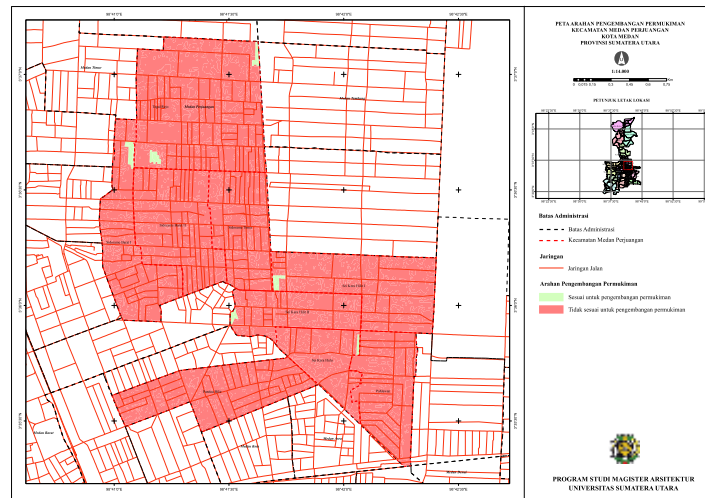


Figure 14: Settlement Development Direction

The direction of development of settlements in the District of Medan Perjuangan can no longer be developed. The area of non-built land in Class C of Medium Development Capacity is 1.02 Ha with a total feasible to be developed by 20%, namely 0.204 Ha. In Class D the Slightly High Development Ability is 0.70 Ha with a total feasible to be developed by 30%, namely 0.21 Ha. In the picture it can be seen that the area marked in green is an area suitable for settlement development. Meanwhile, the red area is not suitable for residential development.

The environmental carrying capacity for settlements in the studied area is 1.23, according to an analysis utilizing the Settlement Carrying Capacity (DDPm) calculation. As a result, the Grompol watershed has a large settlement carrying capacity. According to an examination of environmental carrying capacity, placing a settlement's site in accordance with its designation is the optimal direction. According to some of the aforementioned criteria, settlement places should be created as much as feasible on property with a region that is suitable for habitation. The plan must prioritize using additional settlements while also making an attempt to improve the quality of land in less ideal areas due to the limited quantity of good locations [19].

Carrying capacity research by Ridha (2016) shows that land in the Mpunda District can be used to build urban facilities, such as by setting up an area of protected land. Land capability class 4 or low and extremely low land capability with a land cover ratio of 0% up to 2035 are referred to. [17].

According to the findings of Putri's (2022) study, the first group of residential areas has a capacity of 53%, while the second category has a capacity of just 47%. [20].

According to Tristiani research (2021), the Tembalang region's communities have a land carrying capacity of one DDP (DDPm = 1). Tembalang district's residential land has a maximum capacity of 1 DDP (DDPm = 1), which implies that there are 6 (six) villages in the district that are still able to meet

the needs of residential land, including Rousari Village, Mtisih, Bulusan, Tembalang, Gangli, and Karama Villages.[21].

According to the findings of Bik and Azmi (2018), the study area has two carrying capacity classes: 17.82 Ha (95.61 percent of the total study area), carrying capacity II (land suitable for living), and 0.82 Ha (carrying capacity class III (living). 0.82 hectares, or approximately 4.39 percent of the total study area (suitable for marginal areas), occupy 0.82 hectares, or approximately 4.39 percent of the total research area of the study. The management guidelines for steep slopes are ineffective, and improving the geometry of the slope is insufficient to address the problem of flooding. A dike could be a more effective solution. The land support capacity is the number of people or troops that the land can support in a given situation [22].

4. CONCLUSION

According to the results of the land capability unit calculation, Medan Perjuangan Sub-District has two land capability classes: class C and class D. Class C has a score of 84-107 and a land area of 212.53 ha, indicating moderate development ability. With a land area of 249,94 ha, class D has slightly high development ability. The available land area (undeveloped land) that can be developed for settlements is 0.414 ha.

0.0015, which is equal to DDP 1, indicates that the settlements' carrying capacity is insufficient to meet the needs of the settlements in Medan Perjuangan sub-district. The maximum number of individuals that can be accommodated is 156. Only 0.414 Ha of land is suitable for residential construction based on the settlement development plan. As a result, there is a dearth of land suitable for residential construction.

The goal of the Medan Perjuangan District's land carrying capacity plan is to create a protected area. This protected area is targeted at areas with class 4 land capability, as well as low and very low land capability. The findings of this study may be useful for: (a) It is hoped that the government will take special care and attention in developing the Medan Perjuangan Sub-District in the future. b) The findings of this study are expected to serve as a reference and motivation for other researchers to conduct research in the Sub-District of Medan Perjuangan, particularly in order to improve the quality of settlements in the District of Medan Perjuangan. It is hoped that further researchers can conduct studies on appropriate handling for areas with high levels of Building Coverage such as Medan Perjuangan Sub-District so that this area still has environmental quality and decent settlement quality.

REFERENCES

- [1] Firdianti, Sri. 2010. *Perkembangan Penduduk Di Kecamatan Ngemplok Kabupaten Boyolali Tahun 1997 – 2007. Skripsi*. Surakarta : Universitas Sebelas Maret.
- [2] Lestari, Dwi Suci Sri dan Djumiko. 2017. *Perkembangan Perumahan dan Permukiman Sebagai Penentu Arah dan Bentuk Kebutuhan Permukiman di Pinggiran Kota. e-jurnal Teknik Sipil dan*

Arsitektur Fakultas Teknik UTP Surakarta Vol. 21 No 25. Surakarta : Universitas Tunas Pembangunan Surakarta.

- [3] Hamzah, F., Aulia, D.N., and Marisa, A. (2020). The Distribution Pattern Analysis of Housing in Medan the Nearest Neighbor Analysis Approach. *IOP Conf. Series. Earth and Environment Science*, 452.
- [4] Badan Pusat Statistik Kota Medan. 2021. Kecamatan Medan Perjuangan Dalam Angka Tahun 2021. Medan: Badan Pusat Statistik Kota Medan.
- [5] Badan Pusat Statistik Kota Medan. 2022. Kecamatan Medan Perjuangan Dalam Angka Tahun 2022. Medan: Badan Pusat Statistik Kota Medan.
- [6] Medan City Government. 2020. SK Walikota Medan City Number 640/06.K/XII/2020 *Tentang RP2KPKP (Plan for Prevention and Improvement of the Quality of Urban Slums) of Medan City*. Medan.
- [7] Muta'ali, Lutfi. 2012. *Daya Dukung Lingkungan Untuk Perencanaan Pengembangan Wilayah*. Yogyakarta: Badan Penerbit Fakultas Geografi Universitas Gajah Mada.
- [8] Badan Pusat Statistik Kota Medan. 2021. Kecamatan Medan Perjuangan Dalam Angka Tahun 2021. Medan: Badan Pusat Statistik Kota Medan.
- [9] Badan Pusat Statistik Kota Medan. 2022. Kota Medan Dalam Angka Tahun 2022. Medan: Badan Pusat Statistik Kota Medan.
- [10] Sugiyono. 2013. *Metode Penelitian Kuantitatif, Kualitatif dan R&D*. Bandung: Alfabet. CV
- [11] Badan Standarisasi Nasional. 2004. *SIN 03-1733-2004 Tentang Tata Cara Perencanaan Lingkungan Perumahan di Perkotaan*. Jakarta : Badan Standarisasi Nasional Republik Indonesia.
- [12] Public Work Regulation No. 20/PRT/M/2007, tentang Pedoman Teknik Analisis Aspek Fisik & Lingkungan, Aspek Ekonomi, Aspek Sosial dan Budaya.
- [13] Muta'ali, Lutfi. 2015. *Teknik Analisis Regional Untuk Perencanaan Wilayah Tata Ruang dan Lingkungan*. Yogyakarta: Badan Penerbit Fakultas Geografi (BPFGE).
- [14] Ministerial Regulation No. 41/PRTM/2007, tentang Modul Terapan Pedoman Kriteria Teknis Kawasan Budidaya.
- [15] Duwila, R., Tarrore, R. C., & Takumansang, E. D. 2019. Analisis Kemampuan Lahan di Pulau Sulabesi Kabupaten Kepulauan Sula. *SPASIAL*, 6(3), 703-713.
- [16] Sarita, W., Kumurur, V. A., & Makarau, V. H. 2022. Analisis Kesesuaian Lahan Permukiman Berbasis Kemampuan Lahan di Kabupaten Halmahera Utara. *Sabua: Jurnal Lingkungan Binaan dan Arsitektur*, 11(1), 41-50.
- [17] Ridha, R., Vipriyanti, N. U., & Wiraswasta, I. A. 2016. Analisis Daya Dukung Lahan Sebagai Pengembangan Fasilitas Perkotaan Kecamatan Mpunda Kota Bima Tahun 2015-2035. *Jurnal Wilayah dan Lingkungan*, 4(1), 65-80.
- [18] Ruslan, R., Yahya, F. A., & Surya, B. 2021. Analisis Kemampuan Lahan Kawasan Perkotaan Wawo Kabupaten Kolaka Utara. *Journal of Urban Planning Studies*.
- [19] Muryani, C., & Yusuf, Y. (2019, October). Carrying Capacity of Grompol Waterwashed Settlements, Central Java. In *IOP Conference Series: Earth and Environmental Science* (Vol. 328, No. 1, p. 012072). IOP Publishing.

- [20] Putri, Fairus Jelita Regita. 2022. *EVALUASI DAYA DUKUNG LAHAN PERMUKIMAN DI KAWASAN RAWAN BENCANA GEMPABUMI KELURAHAN PANJANGREJO, KAPANEWON PUNDONG, KABUPATEN BANTUL, DAERAH ISTIMEWA YOGYAKARTA*. Other thesis, UPN “Veteran” Yogyakarta.
- [21] Tristiani, F; Harjanti, I M, Septiarani, B. 2021. Analisis Daya Dukung Lahan Potensial Permukiman di Kecamatan Tembalang Tahun 2021-2041. *Jurnal Riptek*. Vol. 15 (1): 80-90.
- [22] Bik, Azmi Muhammad Syauqi. 2018. “*DAYA DUKUNG LAHAN UNTUK PERMUKIMAN DI BUKIT MULYOKUSUMO, DUSUN BANTUT V, DESA SIDOREJO, KECAMATAN GODEAN, KABUPATEN SLEMAN, D.I.Y.*”. Other thesis, Universitas Pembangunan Nasional “Veteran” Yogyakarta.