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Developmental Factor Analysis Palu City Settlements

(Case Study of Mantikulore District)

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Abstract:- The development of Palu City, especially in Mantikulore District, is increasing rapidly, exposing this region to numerous challenges in providing the needs of its residents, including the needs for housing and settlements, facilities and infrastructure, energy, and other basic public services. The objective of this study was to identify the most influential factors on settlement development in Mantikulore District and determine an improvement approach to support settlement development in this area. This research used quantitative statistical analysis techniques with factor analysis. Data collection methods were observation and questionnaire distribution with a total of 217 respondents. The results of this study indicate that the factor that most influences the development of settlements in Palu City, especially Mantikulore District, is the settlement facilities and infrastructure factor, with the highest variance value of 35.195%. To support the development of settlements in this area, it is necessary to increase the availability and quality of housing and settlement facilities and infrastructure.

Keywords:- *Factor Analysis, Settlement, Settlement Facilities and Infrastructure, Mantikulore District.*

I. INTRODUCTION

Demographers predict a near doubling of the urban population by 2050. This is almost universal in urban areas around the world. If this population density trend continues, it is predicted that land cover will increase by 1.2 million square kilometers by 2030. [1]

Several cities in developing countries are rapidly transforming in terms of their environment, economy, society, climate change, and access to affordable housing, which is impacting development. This has become a benchmark for planning and modeling sustainable urban development. [2]

In recent years, more in-depth research has been conducted on the importance of a region in improving the trajectory of sustainable economic growth. [3] Urban areas are the most dynamic places that experience development in various dimensions. It is undeniable that urbanization has become an anthropogenic activity that affects land use. This has led to changes in land cover. Some developing countries are trying to take action to improve urban planning in handling spatial and urban growth patterns. [4]

The rapid rate of expansion that occurs in urban areas is often associated with the birth of informal settlements that can cause social and environmental problems and are projected to hinder sustainable development. [5]

Settlement development often starts with a single house or an individual household that gradually grows into a settlement of several houses. [6] The rapid development of settlements in urban areas is the cause of high urbanization flows. This condition has the potential to cause the emergence of uncontrolled settlements. [7]

Poverty and the lack of availability of affordable housing for the community are socio-economic problems that pose several challenges. This has great potential to create slums. These inadequate settlements cannot fulfill the basic service needs of the people living in them. [8]

One of the main needs of the community that must be met is the need to have a place to live. Weak law enforcement and population awareness of the environmental order in the spatial plan have an impact on the emergence of settlement areas in various locations that are not in accordance with their designation. [9]

In Indonesia, problems related to the housing fulfillment are the most frequently discussed, along with the increase in human population. The occurrence of settlement development also spurs humans in trying to fulfill the need for adequate housing. Mantikulore District is one of the areas experiencing the phenomenon of rapid settlement development in Palu City. Population growth in this area continues to increase, the total population of Mantikulore District in 2022 is 78,344 people with a population growth rate of 4.93% [10].

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II. LITERATURE REVIEW

A. Some Related Concepts and Literature Reviews that Support the Object of Research are Described below:

➢ *Settlements*

Settlement can be interpreted as an area with a rapid population growth rate and causes the need for housing as the main need to increase. This will certainly have an impact on the availability of land that does not increase, which is inversely proportional to the high increase in population over time. It will automatically cause an imbalance that includes a limited land area with the population's desire for unlimited land. [11]

Geographical factors are one of the aspects that influence human settlement patterns, where geographical differences in the form of land terrain have a role in the spatial pattern of the suitability of human settlement environments. The government will be challenged to handle the balance between increasing population and land use change. The rapidly developing socio-economy also influences the acceleration of population growth and settlement expansion. [12]

The rapid development of the social economy requires reorganization in an area mainly related to social and economic development factors, because it has caused significant changes in the pattern and distribution of residential areas. [13]

➢ *Factor Analysis*

Factor analysis is a method used to see whether the construct specifications developed theoretically are in accordance with the underlying construct concept after testing several measured variables. [14]

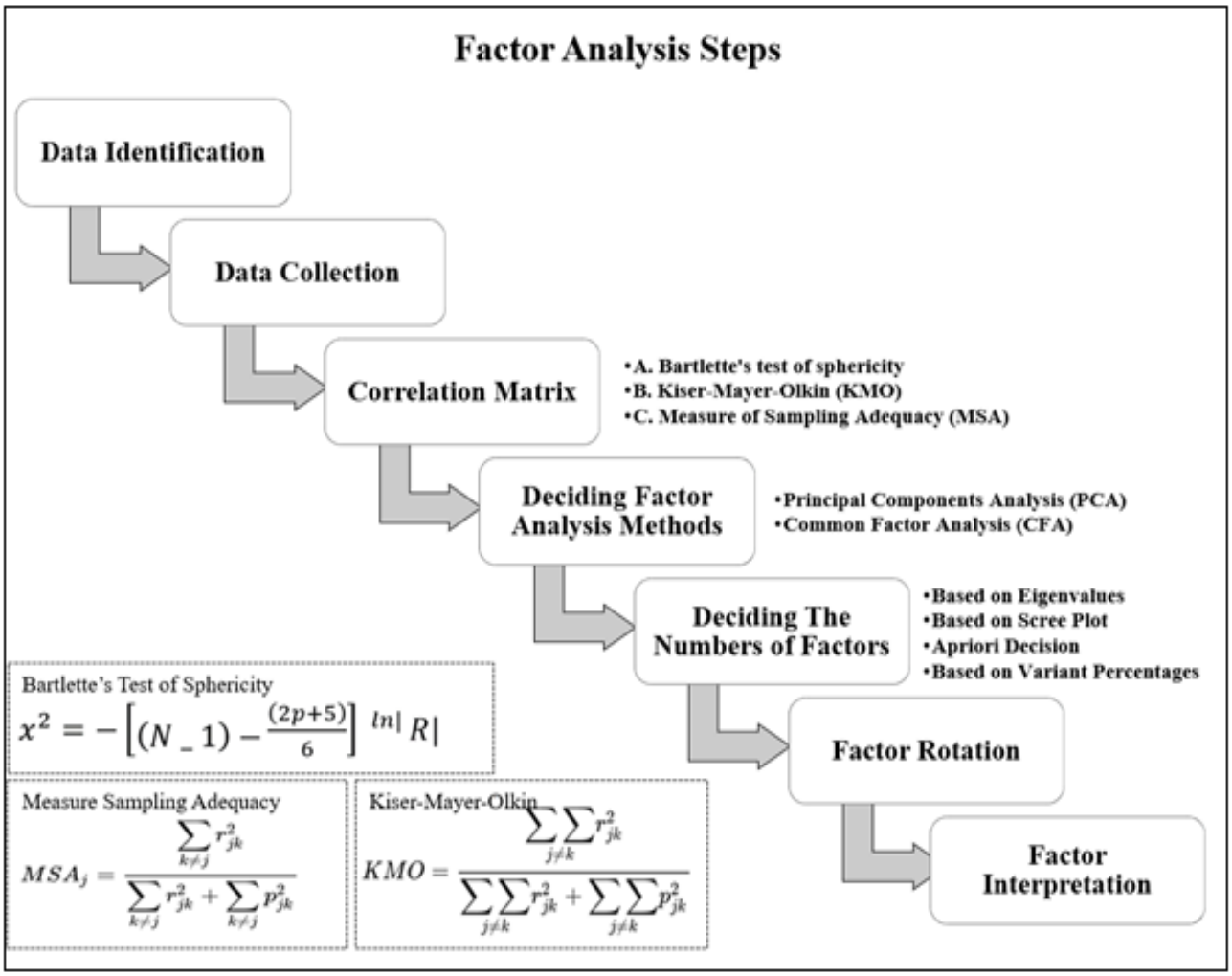

Fig 1 Steps Factor Analysis

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III. METHODS

This research identifies the most influential factors on settlement development in Mantikulore District using factor analysis and determines the improvement approach to support settlement development in this area. The conceptual model of settlement development factors in the research is shown in Figure 2.

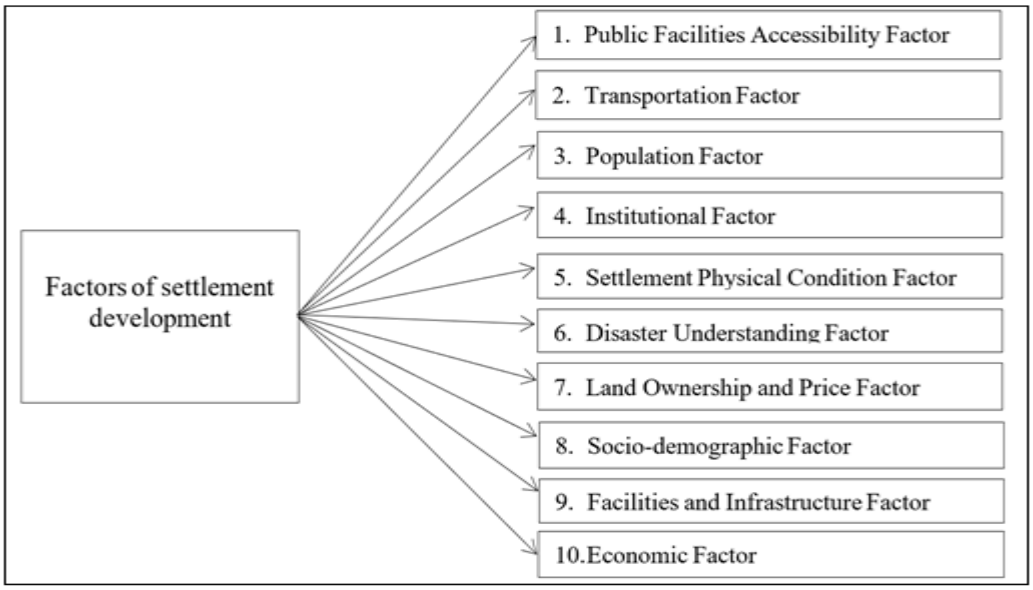

Fig 2 Factors of Settlement Development

Mantikulore District is located between 0º.48" - 0º.54" N-S and 119º.53" - 121º.1" E with an area of 206.8 km² consisting of 8 urban villages [10] as shown in Figure 3.

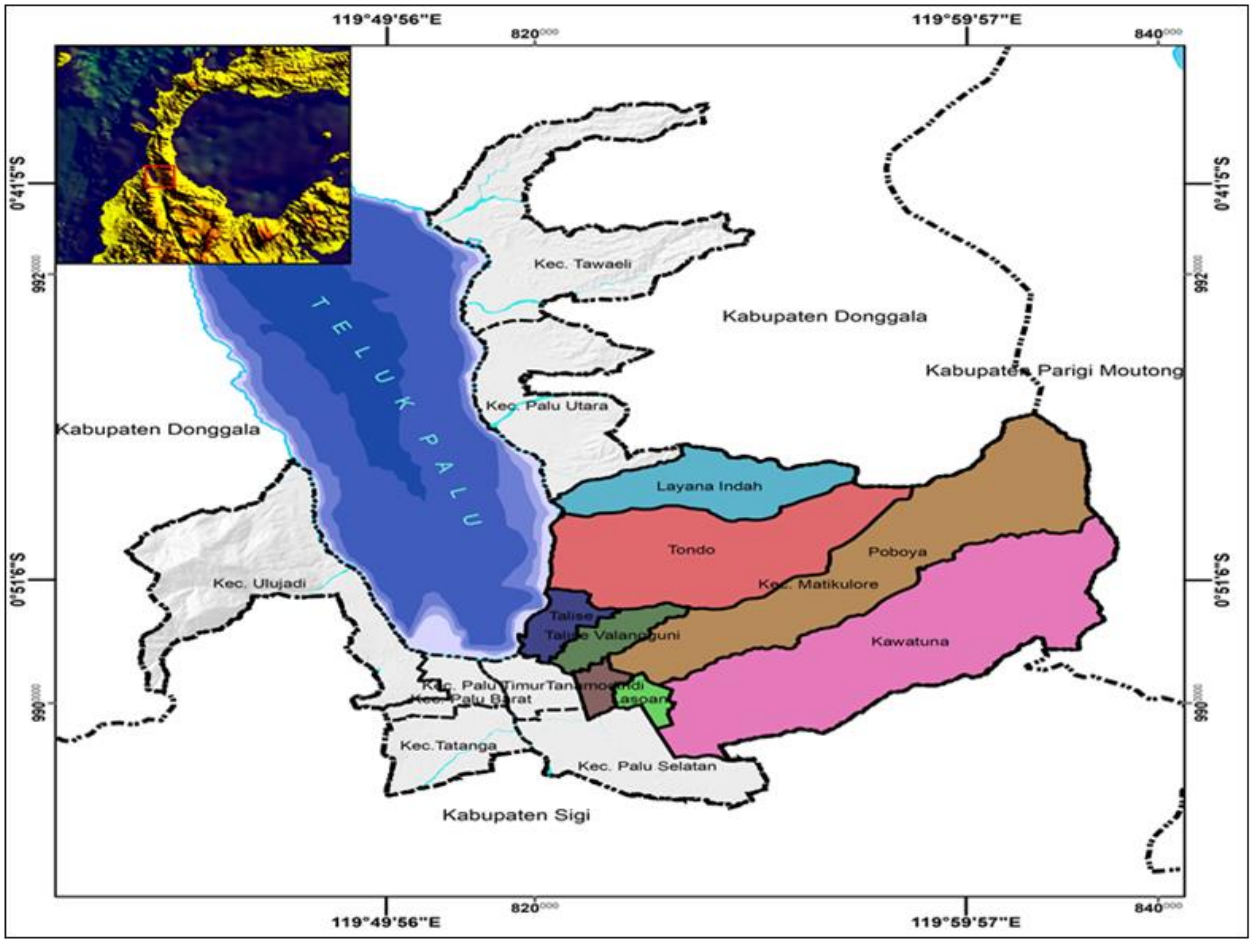

Fig 3 Research Location

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The total area of Mantikulore District is 206.8 km² which is divided into eight Districts, namely Talise Village 7.27 km², Tanamonindi Village 3.33 km², Lasoani Village 36.86 km², Kawatuna Village 20.67 km², Poboya Village 63.41 km², Tondo Village 55.16 km², Layana Indah Village 15.00 km² and Talise Valangguni Village 5.10 km².

The largest population of Mantikulore District is in Tondo Village with a percentage of 21.14% and the highest growth rate at 12.70%.

Table 1 Population Information for Mantikulore District

No	Urban Villages	Amount of Resident	Growth Rate	Settlement Area (km^2)	Population Density per km^2
1	Tondo	16,565	12.70	3.56	4,653
2	Layana Indah	4,583	3.99	0.70	6,547
3	Talise	14,943	-2.64	1.51	9,896
4	Talise Valangguni	7,146	8.41	1.08	6,617
5	Tanamodindi	13,383	1.05	1.84	7,273
6	Lassoani	11,841	3.43	1.21	9,786
7	Poboya	4.103	14.01	0.56	7,327
8	Kawatuna	5,780	4.34	0.95	6,084
	District _ Manticulore	**78,344**	**4.93**	**10.85**	**7,221**

The population density in Mantikulore District based on the area of Mantikulore District (206.8 km²) in 2022 is 379 people/km², while if based on the area of residential areas (10.85 km²) the population density of Mantikulore District reaches 7,221 people/km². The settlement area of Mantikulore District is based on the evaluation document of the spatial utilization of Palu City in 2022 obtained from the Spatial Planning and Land Agency of Palu City. The range of population density in the residential area of Mantikulore District is from 4,653 people/km² to 9,896 people/km². The range of densities is quite wide which indicates that the land use of settlements is still not effective because some are still concentrated in areas close to the city center or business center.

➢ *Development Settlement*

Settlement development in Mantikulore District is growing quite rapidly. The development of settlements in this area can occur due to several factors such as settlement location, transportation, population, institutions, physical conditions, understanding of disaster, land ownership, socio-demographics, facilities and infrastructure, and economy. The existence of these factors is a reference for researchers to see what factors most influence the development of settlements in Mantikulore District. The level of population density continues to increase from year to year, causing settlement development to occur quite rapidly in Mantikulore District.

➢ *Land use*

Land use in Mantikulore District can be seen in Figure 3, which was obtained from the Spatial Planning and Land Agency of Palu City based on the 2021 land use map.

The settlement area has an area of 10.85 km² this area is the third largest area. The most extensive area is in the form of vacant land / shrubs / forests, namely 89.63 km², where this area is mostly in hilly areas. The highland forest area with an area of 66.01 km² is mostly in the east. While the plantation area with an area of 3.72 km² is almost entirely located in all urban villages.

IV. RESULTS AND DISCUSSION

This research uses quantitative statistical analysis techniques SPSS software, which begins with the Validity Test and Reliability Test. Respondents were community institutions established by the urban villages government (RT and RW chiefs) in all urban villages areas in Mantikulore District, totaling 217 people.

➢ *Characteristics Respondent*

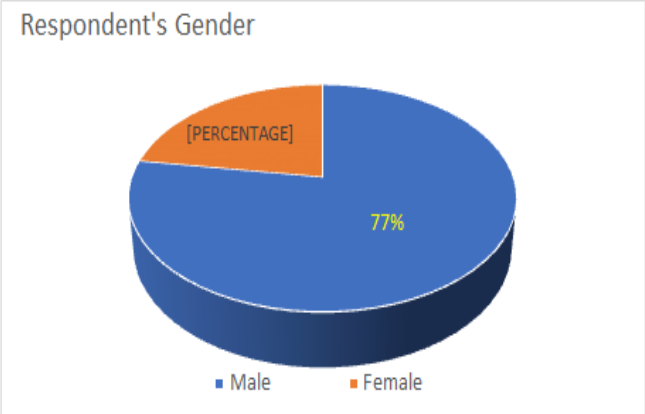

Fig 4 Gender Diagram Respondent

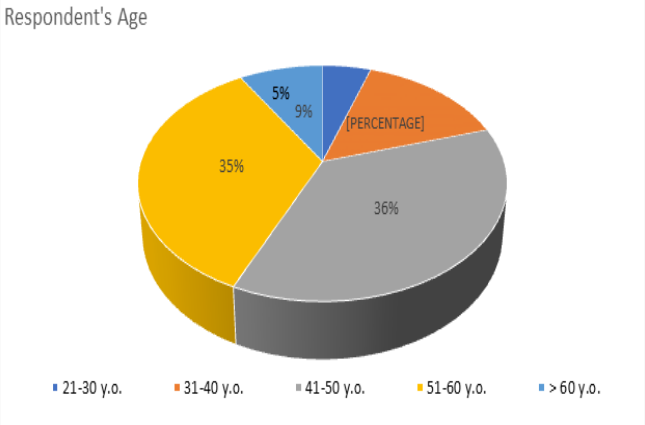

Fig 5 Age Diagram Respondent

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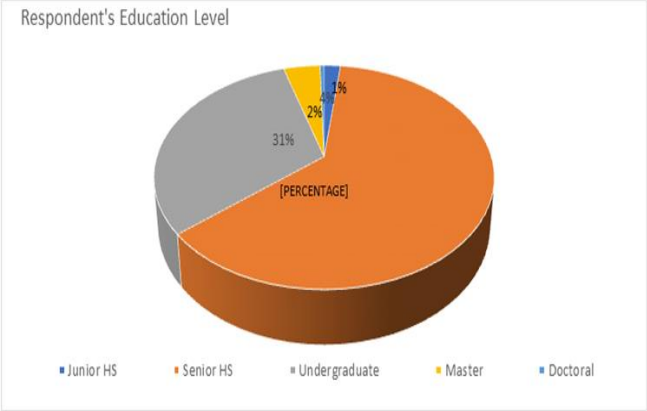

Fig 6 Diagram of Respondents' Education Level

➢ *Validity Test*

The correlation technique used to test the validity of the statement items in this study is the *Bivariate Pearson Correlation*. This is done by correlating each indicator item score with the total variable score on the questionnaire. If $r_{count} > r_{table}$, then the instrument is declared valid, and if $r_{count} < r_{table}$ then the instrument is declared invalid. In this validity test, the researcher tested the answers of 217 respondents, using a confidence level of 95% or level of significance (α) = 0.05, then obtained an r_{Table} of 0.133. From the calculation results obtained that $r_{count} > r_{table}$ (0.133) all indicators on the questionnaire are declared valid, so that the data on each indicator can be analyzed further.

$$r = \frac{N(\sum XY) - (\sum X \sum Y)}{\sqrt{[N\sum X^2 - (\sum X)^2][N\sum Y^2 - (\sum Y)^2]}}$$

r = Correlation Coefficient
N = Number of Samples (Respondents)
X = Statement Score
Y = Total Score

➢ *Reliability Test*

In this study, a reliability test was conducted to measure the consistency of the questionnaire used to measure the influence of Settlement Location Factors (X_1), Transportation Factors (X_2), Population Factors (X_3), Institutional / Government Factors (X_4), Physical Condition Factors (X_5), Disaster Understanding Factors (X_6) Land Ownership Status (X_7), Socio-Demographic Factors (X_8), Facilities and Infrastructure (X_9), and Economic Factors (X_{10}). If the Croncach's Alpha value is >0.60 then each variable tested has a reliable indicator. [15]

The test results state that all statements in these variables are declared reliable, so it can be said that the questionnaire has consistent results if measurements are taken at different times and models or designs.

Table 2 Reliability Test Results

Variable	***Cronbach's Alpha***	**Information**
Settlement Locations (X_1)	0.930	Reliable
Transportation (X_2)	0.872	Reliable
Population (X_3)	0.886	Reliable
Institutional (X_4)	0.634	Reliable
Condition Physical (X_5)	0.874	Reliable
Understanding Disaster (X_6)	0.848	Reliable
Ownership Status (X_7)	0.851	Reliable
Social Demographics (X_8)	0.788	Reliable
Facilities and Infrastructure (X_9)	0.940	Reliable
Economy (X_{10})	0.860	Reliable

➢ *Kaiser Meyer Olkin (KMO) Test and Bartlett's Test*

Table 3 Factor Extraction Results

KMO and Bartlett's Test	
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	,923
Bartlett's Test of Sphericity Approx. Chi-Square	9264.369
df	1540
Sig.	,000

The resulting KMO value is 0.923 > 0.5 and Bartlett's Test shows the Approx Chi-Square number 9264.369, with a Degree of Freedom (df) value of 1540 and the significance value is 0.000 which is smaller than 0.05. Therefore the data in this study are considered feasible, and data analysis can proceed to the MSA value retest stage.

➢ *Measure of Adequacy (MSA) Test*

The MSA test is used to measure homogeneity between variables and filter between variables so that only eligible variables can be processed further. This test has a function to analyze the adequacy of the sample on each variable studied. If MSA ≥0.50 then the indicator can be analyzed. [16]

The test results show that all indicators studied are worth >0.5, this means that the analysis process carried out is correct and can be continued to the next stage.

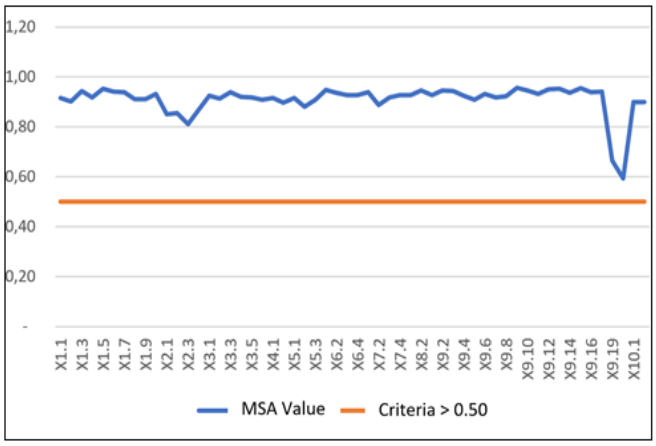

Fig 7 Measure of Adequacy Test Results

➢ *Factor Extraction*

Factor extraction aims to determine the number of factors used in presenting data and how much each factor contributes to the research phenomenon. This analysis can produce factors with a smaller number than the number of variables processed. The factor extraction method used in this research is Principal Component Analysis. The approach used to determine the number of factors obtained in this study is based on Eigen value, percentage variance and scree plot. [17]

The amount of variance that can be explained by the seven new factors formed shows the amount of influence given to the performance of the construction workforce of 65.338%, while the remaining 34.662% is influenced by other factors outside of the indicators used in this study. And because the cumulative variance value is 65.338%, it exceeds 60% of the required cumulative variance, so it can be continued in the next analysis.

Table 4 Factor Extraction Results

Total Variance Explained						
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumu relative %	Total	% of Variance	Cumu relative %
1	19,709	35,195	35,195	19,709	35,195	35,195
2	4,918	8,782	43,976	4,918	8,782	43,976
3	4,096	7,315	51,291	4,096	7,315	51,291
4	2,561	4,574	55,865	2,561	4,574	55,865
5	2,096	3,743	59,608	2,096	3,743	59,608
6	1,661	2,966	62,573	1,661	2,966	62,573
7	1,548	2,764	65,338	1,548	2,764	65,338
8	,987	1,763	67,101			
9	,942	1,682	68,783			
…	…	…	…			
…	…	…	…			
…	…	…	…			
54	,107	,191	99,707			
55	,083	,149	99,856			
56	,080	,144	100,000			

In addition to the previous table, the factor extraction of this study can also be seen in the Scree Plot image.

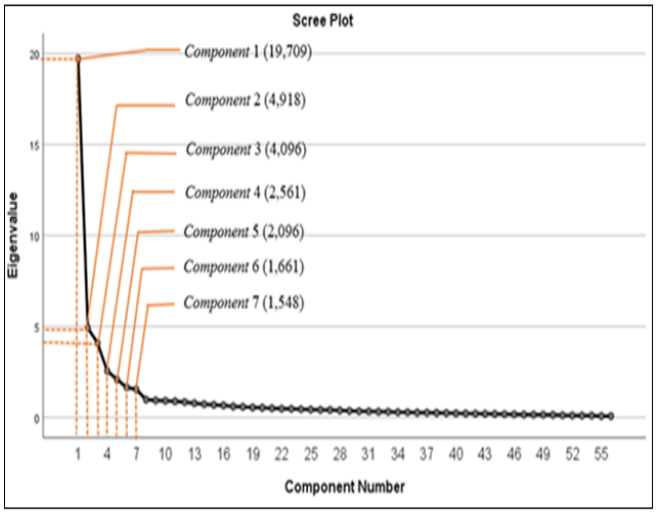

Fig 8 Graph *Scree Plot*

The Scree Plot graph shows that there are 7 components that have an eigenvalue of more than 1, so this factor extraction results in 7 new factors that have been formed.

➢ *Components Matrices and Rotation*

To determine the factors that are included in the seven factors formed, it is necessary to rotate the factors. The rotation process in this study aims to obtain factors with loadings that are clear enough for interpretation. From this, it is obtained information that the largest correlation value in each factor (component) indicates that the sub-factor is included in the factor. [18]

In this study, the varimax rotation method was used, which focuses its analysis on simplifying the factor matrix column or by making the item correlation only dominant to one factor. The trick is to make the item correlation close to the absolute value of 1 and 0 on each factor, making it easier to interpret each dominant item.

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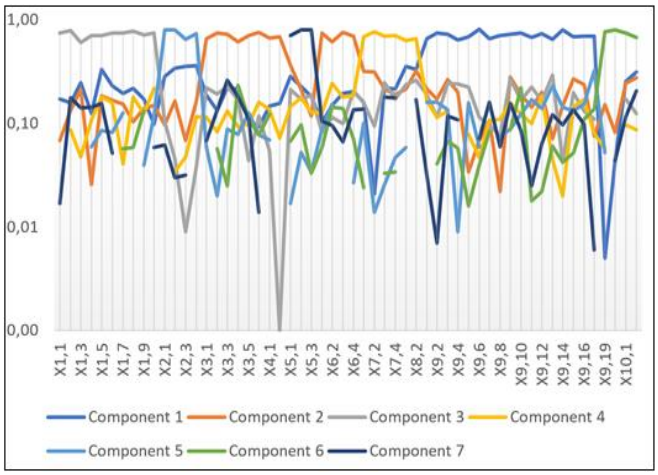

Fig 9 Rotated Component Matrixes

➢ *Interpretation of Factors*

From the research results that have been processed and analyzed previously, it shows that there are seven factors that influence the development of settlements in Mantikulore District, namely:

- Settlement facilities and infrastructure factor,
- This factor has the highest variance value of 35.195%, which means that this factor is the factor that has the greatest or most dominant influence compared to other factors.
- Population and disaster understanding factors, with a variance value of 8.782%.
- Public Facilities Accessibility Factor, with a variance value of 7.315%
- Land Ownership and Socio Demographic Factors, with a variance value of 4.574%
- Transportation factor, with a variance value of 3.743%
- Economic Opportunity Factor, with a variance value of 2.966%
- Physical Condition Factor, with a variance value of 2.764%

V. CONCLUSION

The development of settlements in Mantikulore District is influenced by seven factors. These seven factors are: 1) settlement facilities and infrastructure; 2) population and understanding of disaster; 3) settlement location; 4) land ownership and socio-demography; 5) transportation; 6) economic opportunities; 7) physical conditions. According to the results of the factor analysis test, the amount of influence generated from all these factors reached 65.338% while the remaining 34.662% was influenced by other factors whose influence was not significant (other factors outside of the indicators used in the study). The factor that has the highest influence on settlement development in Palu City, especially Mantikulore District, is the settlement facilities and infrastructure factor, with the highest variance value of 35.195%.

It is necessary to increase the availability and quality of housing and settlement facilities and infrastructure to support settlement development in this area.

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