Analysis of Spatial Relationships between Educational Facilities, Area, and Population Density in Lampung Province

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Article Info

Abstract

Indicators of sustainable development include equal access to education. However, when administrative region and population density are taken into account, educational resources are still unevenly distributed throughout Indonesia's numerous provinces. Lampung was chosen as the research location due to its rapid population growth over the last two decades, which has influenced demand for educational services and the distribution of other public resources. Lampung has 9.52 million people and covers 33,570 km². The importance of this study stems from the necessity to understand the geographical link between these variables in order to facilitate spatial data-based regional planning that is more equitable and efficient in terms of educational distribution. This study used statistical analysis, namely Pearson correlation analysis, to establish the degree of relationship between variables. The study discovered that the area has a Pearson correlation coefficient of 0.674 on the number of educational institutions. The Pearson correlation between population density and the number of educational facilities is -0.139, indicating a very weak relationship. The multiple correlation calculation of the relationship between area and population density with educational facilities provides a strong result of 0.745, suggesting that the larger the area in a region and the denser the population, the more educational facilities are required. Lampung's major districts are Way Kanan, Tulang Bawang, and Pesisir Barat, which rank third, fourth, and sixth respectively. However, in terms of educational facilities, Way Kanan, Tulang Bawang, and Pesisir Barat rank sixth, ninth, and fourteenth, respectively. Lampung province's population facilities and administrative areas remain significantly different.

INTRODUCTION

In today's civilized society, education is a crucial component of the humanization process. Since education is the strategic foundation of growth, it is imperative for the Indonesian nation to prioritize education for the purpose of development (Hakim, 2016). One of the key markers of sustainable development is equal access to education, particularly when it comes to achieving Sustainable Development Goals (SDGs) number 4, or Quality Education (Safitri et al., 2022). However, there is considerable inequity in the distribution of educational facilities within Indonesia, particularly when examined in terms of administrative area and population density. Similar difficulties exist in Lampung Province, one of the key

regions on the island of Sumatera, where there are notable variations in the population, sub-district size, and accessibility of educational resources among districts and towns.

Table 1. Research on the Uneven Number of Schools in Lampung

No	Location / Study	Distribution Findings	Source
1	Bandar Lampung (SMA)	Uneven distribution; some sub-districts do not have senior high schools	(Permatasary et al., 2025)
2	Bandar Lampung (PPDB Zona)	There are zones not served by public schools	(Ristanti et al., 2022)
3	South Kotabumi	Random elementary/junior high schools, senior high/vocational high schools are clustered; there are villages without schools	(Cahyani et al., 2025)
4	Central Lampung	Uneven distribution	(Asrori et al., 2013)

The importance of this research stems from the necessity to establish spatial correlations between these factors in order to promote spatial data-driven regional planning that is more equitable and efficient in terms of educational equity. Gaps in public amenities such as schools are particularly substantial in places with low population density but wide expanses (Nugroho & Suyanto, 2020). More than 70% of sub-districts in provinces with considerable demographic variability lack a corresponding ratio of education facilities to school-age population (Rahmawati, 2020). This emphasizes the significance of a geographical approach in examining the interaction between variables in a regional context.

This study aim to investigate the relationship between the spatial distribution of educational facilities and the characteristics of administrative areas, with the goal of answering the main question: What is the spatial relationship between educational facilities, area, and population density in Lampung province?

Additionally, local governments might use this research as a reference for information about districts or regions with a huge area but few educational facilities.

RESEARCH METHODS

This study employs a descriptive research design and a quantitative methodology. The quantitative approach is used because data is presented in the form of numbers and statistical analysis to explain, test hypotheses, and predict events (Creswell, 2014). The descriptive method is employed to objectively and methodically explain or illustrate the features of a certain population or occurrence without seeking to establish a causal relationship (Sugiyono, 2021).

This research was conducted in Lampung Province, located in the southern part of Sumatera Island, Indonesia. Geographically, it is located at coordinates 4°33'31" South Latitude and 105°24'24" East Longitude (Badan Informasi Geospasial, 2020).
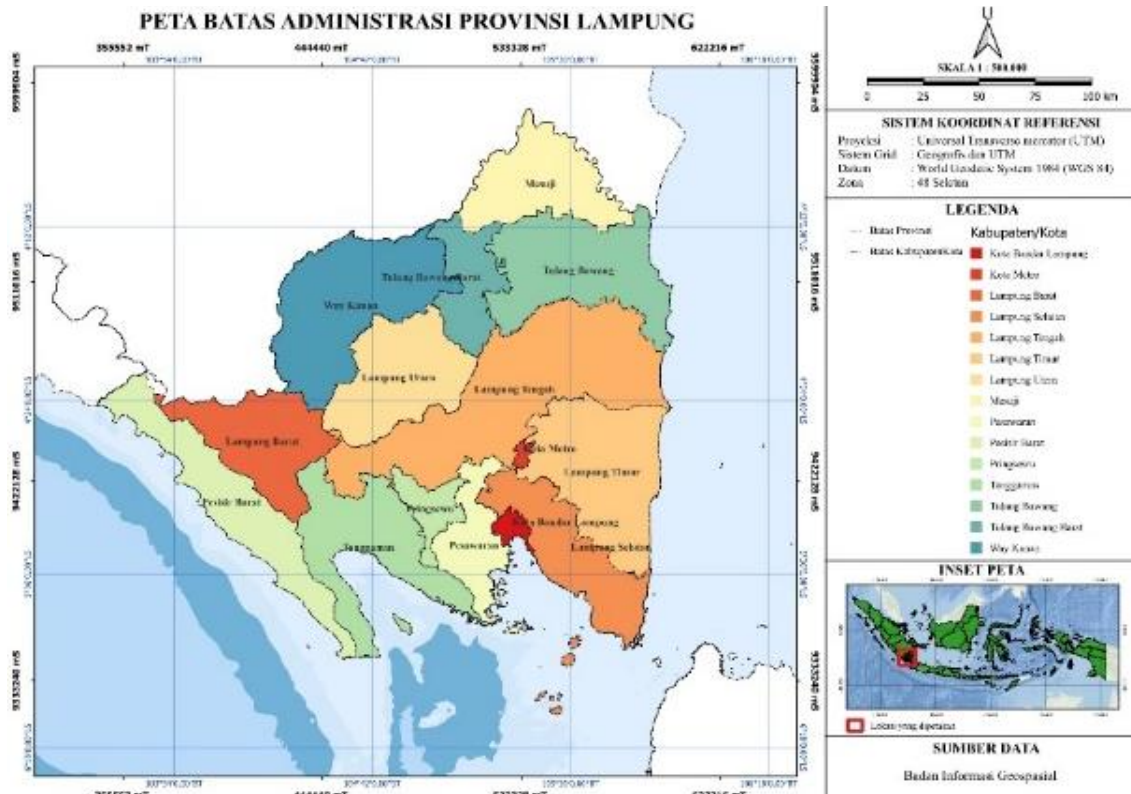
Figure 1. Administrative Map of Lampung Province in 2025

Figure 1 showing the Lampung Administrative Map shows that the administrative area in Lampung consists of 13 Regencies and 2 Cities. The 13 Regencies consist of Lampung Barat, Tanggamus, Lampung Selatan, Lampung Timur, Lampung Tengah, Lampung Utara, Way Kanan, Tulang Bawang, Pesawaran, Pringsewu, Mesuji, Tulang Bawang Barat, and Pesisir Barat. while the two cities consist of Bandar Lampung City as the Provincial Capital and Metro City.

Lampung Province was chosen as the research site because it has witnessed relatively rapid population increase over the last two decades, affecting the demand for educational services and the distribution of other public infrastructure (Badan Perencanaan Pembangunan Daerah (Bappeda) Provinsi Lampung, 2022).

Lampung Province has a population of 9.52 million people and covers 33,570 km^2 (Badan Pusat Statistik, 2025). .
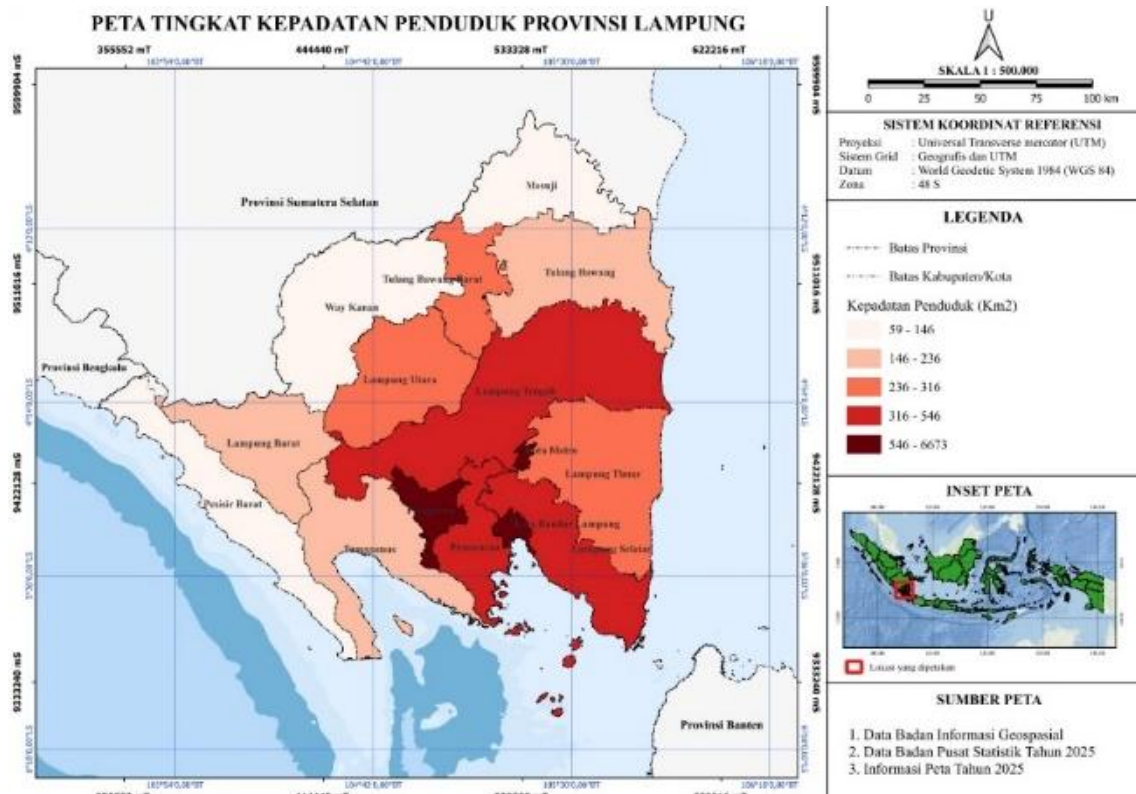
Figure 2. Population Density Map of Lampung Province in 2025

According Based on Figure 2 on the Population Density Map, it is explained that there are two districts, namely Pringsewu and South Lampung, and two cities, namely Bandar Lampung and Metro, which are included in the Very Dense Population.

Table 2. Population Density of Districts/Cities in Lampung Province in 2025

No	District/City	Population (People)	Area (km²)	Population Density Category
1	Lampung Barat	319.300	2.108	Less Dense
2	Tanggamus	678.020	2.948	Less Dense
3	Lampung Selatan	1.133.390	2.227	Very Dense
4	Lampung Timur	1.164.700	3.861	Quite Dense
5	Lampung Tengah	1.541.430	4.560	Quite Dense
6	Lampung Utara	665.760	2.669	Less Dense
7	Way Kanan	503.310	3.522	Less Dense
8	Tulang Bawang	455.400	3.116	Less Dense
9	Pesawaran	506.260	1.288	Quite Dense
10	Pringsewu	429.740	617	Very Dense
11	Mesuji	245.210	2.200	Less Dense
12	Tulang Bawang Barat	301.790	1.257	Less Dense
13	Pesisir Barat	174.860	2.940	Less Dense
14	Bandar Lampung	1.226.210	184	Very Dense
15	Metro	177.520	73	Very Dense
16	**Provinsi Lampung**	**9.522.900**	**33.570**	

Source : Badan Pusat Statistik (2025)

According to table 2, Lampung Selatan, Pringsewu, Bandar Lampung, and Metro have extremely high population densities, whereas Tanggamus, Way Kanan, Tulang Bawang, and Pesisir Barat have huge areas but lower population densities.

Figure 3. Distribution of Educational Facilities in Lampung Province in 2025

Table 3. School Facilities in Districts/Cities in Lampung Province in 2021

No	District/City	Population (People)	Area (km²)	School Facilities
1	Lampung Barat	319.300	2.108	232
2	Tanggamus	678.020	2.948	437
3	Lampung Selatan	1.133.390	2.227	514
4	Lampung Timur	1.164.700	3.861	575
5	Lampung Tengah	1.541.430	4.560	669
6	Lampung Utara	665.760	2.669	452
7	Way Kanan	503.310	3.522	363
8	Tulang Bawang	455.400	3.116	297
9	Pesawaran	506.260	1.288	284
10	Pringsewu	429.740	617	254
11	Mesuji	245.210	2.200	175
12	Tulang Bawang Barat	301.790	1.257	187
13	Pesisir Barat	174.860	2.940	163
14	Bandar Lampung	1.226.210	184	316
15	Metro	177.520	73	76
16	**Provinsi Lampung**	**9.522.900**	**33.570**	4984

Source: Badan Pusat Statistik (2021)

According to Table 3, there are significant regional variations in the number of educational units from the primary to secondary levels, which reflects differences in how educational services are distributed geographically. An analytical method that can gauge the degree of correlation between the three variables is required in order to comprehend the relationship between variables like the number of educational institutions, area, and population density.

To determine the strength of the association between variables, statistical analysis using Pearson Correlation analysis was employed in this study. Pearson Correlation Analysis is a statistical approach for determining the strength and direction of a linear relationship between two quantitative variables (interval or ratio) (Ghozali, 2018). The Pearson correlation coefficient is represented as:

- r = +1, indicates a perfect positive correlation
- r = -1, indicates a perfect negative correlation
- r = 0, indicates no linear correlation

The Pearson correlation calculation utilized in this investigation is as follows (Roflin & Zulvia, 2021).

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

Where:
X = first variable
Y = second variable
n = many observations

$$r_{yx_1x_2} = \sqrt{\frac{r_{yx_1}^2 + r_{yx_2}^2 - 2r_{yx_1}r_{yx_2}r_{x_1x_2}}{1 - r_{x_1x_2}^2}}$$

Where:

$r_{yx_1x_2}$ = multiple correlation coefficient between variables x_1 and x_2
r_{yx_1} = correlation coefficient x_1 against y
r_{yx_2} = correlation coefficient x_2 against y
$r_{x_1x_2}$ = correlation coefficient x_1 against x_2

After computing the Pearson correlation, the next step is to determine the degree of association between the variables, which is known as the correlation coefficient. The correlation coefficient values may be found in the Table 4 below.

Table 4. Pearson Correlation Criteria (Miftahuddin et al., 2021)

No	r-value	Interpretation
1	0.00 – 0.19	Very Low
2	0.20 – 0.39	Low
3	0.40 – 0.59	Moderate
4	0.60 – 0.79	Strong
5	0.80 – 1.00	Very strong

RESULTS AND DISCUSSION

After completing the data collection, the following step is to modify the name of each variable to "X_1, X_2, Y". The following data table is used, where X_1 represents area, X_2 represents population density, and Y represents educational facilities.

Table 5. Research Data

No	District/City	Area (X_1)	Population Density (X_2)	Educational Facilities (Y)
1	West Lampung	2.108	151	232
2	Tanggamus	2.948	230	437
3	South Lampung	2.227	509	514
4	East Lampung	3.861	302	575
5	Central Lampung	4.560	338	669
6	North Lampung	2.669	249	452

7	Way Kanan	3.522	143	363
8	Tulang Bawang	3.116	146	297
9	Pesawaran	1.288	393	284
10	Pringsewu	617	696	254
11	Mesuji	2.200	111	175
12	Tulang Bawang Barat	1.257	240	187
13	Pesisir Barat	2.940	59	163
14	Bandar Lampung	184	6.673	316
15	Metro	73	2.425	76
16	**Lampung Province**	**33.570**	**284**	4984

Using the table 5 above, the next step is to process/calculate the correlation coefficient using multiple correlation coefficients. The correlation calculation for each variable yielded the following results:

Table 6. Correlation Coefficient between Variables X_1, X_2, and Y

Correlation between Variables	Correlation Coefficient Value
$r_{y,x1}$	0.674
$r_{y,x2}$	-0.139
$r_{y,x1,x2}$	0.745

According to the table 6, the Pearson correlation value between the variables of Area (X1) and Educational Facilities (Y) is 0.674, indicating that the level of relationship between the area and educational facilities falls into the category of a strong relationship with a positive direction between the two variables. This demonstrates that the area variable influences the quantity of educational institutions, implying that the larger a region, the more educational facilities should be included.

According to table 4 of the research data, Way Kanan Regency, which is the third largest area in Lampung, has 363 educational facilities. This figure places the regency eighth in terms of educational institutions in Lampung. Furthermore, Tulang Bawang Regency, which is the fourth-largest area in Lampung, has the fewest educational facilities, ranking eighth with 297, while Pesisir Barat Regency ranks sixth with 163 educational facilities, indicating that this regency has serial number 14 in the category of educational facilities in Lampung.

The Pearson correlation value between the Population Density Variable (X2) and Educational Facilities (Y) is -0.139, indicating that the relationship between population density and educational facilities is very low and in the negative direction. This suggests that in the data from this study, the relationship between population density and educational facilities had no meaningful influence.

Other research suggest that the two variables are interdependent and interconnected. Because the teacher-to-student ratio is influenced by the quality of education in densely populated areas, a disparity in the ratio between the number of teachers and students will negatively impact the teaching and learning process (Richardson & Gordon, 2020). According to other research, this disparity in ratio will result in fewer fruitful teacher-student interactions, which will impact learning outcomes as well (Lehmann, 2016). Nonetheless, if backed by suitable regulations and sufficient infrastructure, densely populated areas can also offer top-notch education.

Based on multiple correlation analysis, there is a strong association (0.745) between these three variables. This statistic demonstrates how an area's population density and geographic

location affect the quantity of educational institutions there exist.

CONCLUSIONS AND SUGGESTIONS

The research results show that the location has an effect on the quantity of educational institutions, as evidenced by the Pearson correlation coefficient of 0.674. The larger the territory, the more educational facilities it should have. In Lampung province, there are still districts/cities with insufficient educational facilities for their size.

Aside from the area, the relationship between population density and Pearson's correlation coefficient is quite weak. A low correlation does not imply that there is no relationship between population density and educational facilities. This poor association is caused by an unequal distribution of educational institutions in respect to population density. If educational facilities do not keep up with the dense population, there will be a discrepancy in the ratio of teaching staff/teachers to students. This will impact learning outcomes.

The area and population density with educational institutions have a strong link (0.745) according to the multiple correlation study. This implies that there should be more educational facilities in a location the larger it is and the denser its population. The number of teachers to students ratio is impacted by this.

Suggestions for further researchers can be carried out more detailed observations by looking at the situation and conditions that occur in the field so that we can find out what parameters cause inequality. The results of this study can also be used as suggestions for the Regional Government that Lampung Province with 15 districts/cities, then has a different area and population must maximize educational facilities so that Lampung Province can realize Sustainable Development Goals/SDGs number 4, namely Quality Education.

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