

Analysis of The Correlation of Population Growth to Fulfillment of The Support Capacity of Educational Facilities in Sukabumi District (Case Study of Cisaat District and Surade District)

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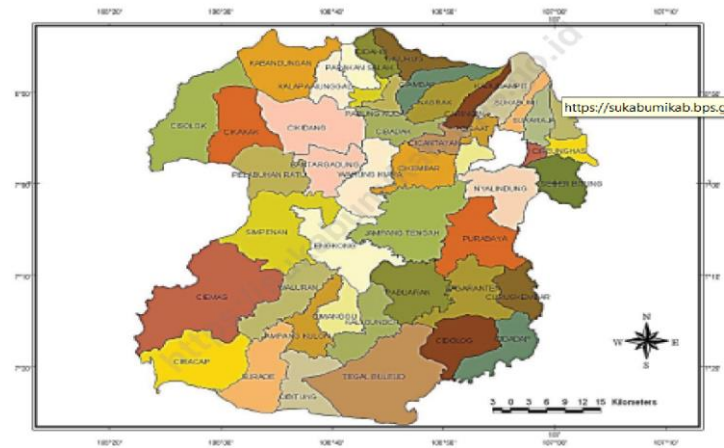
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Abstract– The development of a city cannot be separated from the availability of city facilities and infrastructure to fulfill people's needs. One very important aspect is the aspect of education, in which the development of these educational facilities is not only the domain of the government in its implementation, recently there have been many private roles that have made breakthroughs in the education sector. This research collects data accumulatively based on the level of education starting from elementary, junior high to high school, without disaggregating education data. The quantitative method used in this research uses data sources from the Statistics Agency of Sukabumi Regency. The data is processed and tested in advance related to the correlation between related variables, the results of the correlation test will show whether there is a significant relationship between the rate of population growth and the number of students and the fulfillment of the carrying capacity of existing schools. If the test results find a significant correlation, it will be followed by a projection of the carrying capacity needs of educational facilities for the next 10 years. It is hoped that the results of this study will become a reference for increasing the capacity and quality of educational facilities in the future. From the research results it was found that there was a significant relationship between population growth and the number of students and the carrying capacity of educational facilities. Based on this research, it is possible to calculate the estimated need for school facilities for the next 10 years which can be used as a basis for planning and developing educational facilities in Sukabumi district.

Keywords– Visual Comfort, Natural Lighting, Activities, Coworking Space

1. Introduction

The government should educate the nation's life, that is one of the mandates in the 1945 Constitution. So development (Permana et al., 2020) will not run as a whole if the development of human resources does not go hand in hand and line. One of the government programs that has begun to be implemented is the 9-year Basic Education program (Permana & Wijaya, 2017). Compulsory education for 9 years is in line with the spirit to liberate the Indonesian nation from the shackles of ignorance and poverty, the only way is through education. In the body of Article 31 of the 1945 Constitution, it is even more explicit that states "(1) every citizen has the right to education", and "(2) every citizen (Nurrahman et al., 2022) is obliged to attend basic education and the government is obliged to finance it (Maknun et al., 2020) (Rahadian & Sulistiawan, 2019).



Picture1 Administrative Map of Sukabumi Regency
Source: Sukabumi in 2021 figures

Sukabumi Regency (Setiawan et al., 2022) itself consists of 47 sub-districts spread from north to south, where each sub-district has its characteristics both in terms of demography and population distribution (Permana, Permana, et al., 2020) (Permana, Akbardin, et al., 2020). For this reason, in this study, we tried to make a comparison between 2 sub-districts that have different locations. As a sample from the northern region, we tried to present data for the Cisaat District, while the Surade sub-district represented the area from the South.

According to (Huisman, 1987) Social services generally mean all services provided by the government (directed by the government) and are intended to improve the level of life of the population (Wijaya & Permana, 2018). Facilities (Darmawan, 2020) (Prabawa & Gunawarman, 2020) are a vital aspect in the life of a city, because, without the availability of adequate or balanced facilities (Ghasempourabadi & Hassanzadeh, 2021) between needs and fulfillment, it can result in disruption of city activities, or can even affect the development of the city (Juang Akbardin & Permana, 2020) (J. Akbardin et al., 2020) itself. Facilities are very important because their existence can affect the rebuilding of a city from the worst condition (Yeates & Garner, 1980). The provision of social facilities (Andadari et al., 2021) is one of the urban problems, it can even be said as a national problem.

2. Research METHODS

This research collects data accumulatively based on the level of education starting from elementary, junior high to high school, without disaggregating education data. The quantitative method used in this research uses data sources from the Statistics Agency of Sukabumi Regency. The data is processed and tested in advance related to the correlation between related variables, the results of the correlation test will show whether there is a significant relationship between the rate of population growth and the number of students and the fulfillment of the carrying capacity of existing schools. If the results of the correlation test indicate that there is a significant relationship, it will be continued with the projection of the carrying capacity needs of educational facilities for the next 10 years.

3. Results AND DISCUSSION

3.1. Variable Correlation Analysis

The analytical tool used is a correlation. According to the Big Indonesian Dictionary, the meaning of correlation is a reciprocal or causal relationship. According to (Sarwono, 2006) the meaning of correlation is "Correlational analysis is used to see the strength or weakness of the relationship between the independent variables." In this analysis, we will examine the correlation between population growth and the availability of educational facilities, and the number of students that can be accommodated. In this analysis, we will

use data from the Cisaat District as a sample for testing. The data that forms the basis for calculating correlations are taken from 2017 to 2022, and we can display it in the following table:

Table1 Total population and number of students according to education level

NO	POPULATION	2017	2018	2019	2020	2021	2022
1	RESIDENT	118,950	119,572	119,717	120,700	129,643	129,704
2	SD	11,788	11,570	10,408	10,580	9,972	10,243
3	JUNIOR HIGH SCHOOL	5,052	4,935	3,431	3,343	3,218	3,216
4	SMA/SMK	5,453	5,589	4,172	3,299	2,390	3,852
5	IBTIDAIYAH	5,275	5,275	4,901	5,145	5,019	4,919
6	THANAWIYAH	3,323	3,323	3,297	3,328	4,949	4,948
7	ALiyah	2.127	2.127	1,389	1,392	1,489	2.185

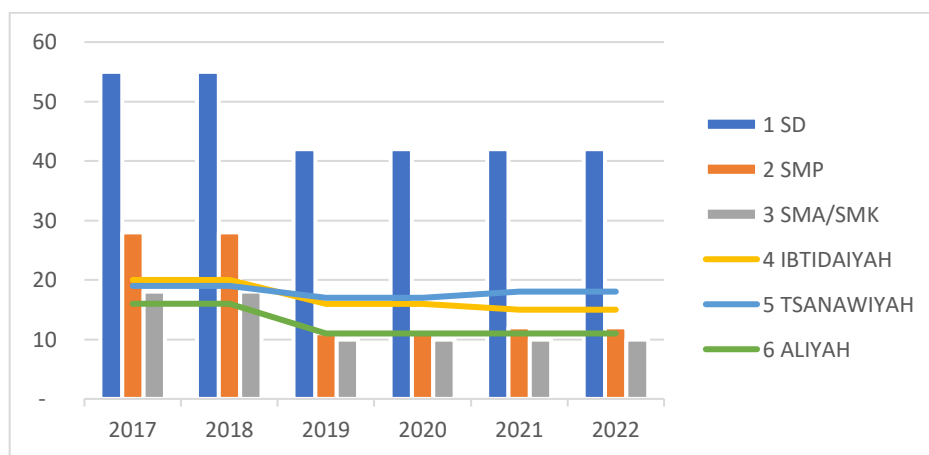
Source: Cisaat District in figures from 2017 to 2022

In table 1 we can see that there has been a decrease in the number of students in 2019, which is one of the impacts arising from a phenomenon that has occurred as a result of the Covid 19 pandemic in Indonesia. Where many students drop out of school because of work. Some SMK and SMP students were forced to work because their parents were economically affected during the pandemic. So the child must help the family economy. Another reason for dropping out of school is the lack of facilities for implementing distance learning (PJJ), for example, gadgets, study quotas, electricity supplies to poor operator signals. Meanwhile, the number of existing educational facilities during this time can be seen in the following table:

Table2 Number of schools based on the education level

NO	SCHOOL TYPE	2017	2018	2019	2020	2021	2022
1	SD	55	55	42	42	42	42
2	JUNIOR HIGH SCHOOL	28	28	11	11	12	12
3	SMA/SMK	18	18	10	10	10	10
4	IBTIDAIYAH	20	20	16	16	15	15
5	THANAWIYAH	19	19	17	17	18	18
6	ALiyah	16	16	11	11	11	11
NUMBER OF SCHOOLS		156	156	107	107	108	108

Source: Cisaat District in figures from 2017 to 2022



Picture 2 Education facility growth graph
Source: Cisaat District in figures from 2017 to 2022

From the table above it can be seen that the number of schools decreased in 2019, and in 2022 it is seen that there will be an increase again. Furthermore, the data will be

processed using multiple correlation coefficient analysis techniques where the data needed is in the form of intervals and ratios, as can be seen in the following table:

Table3 Multiple correlation analysis

YEAR	TOTAL POPULATION	THE NUMBER OF STUDENTS	NUMBER OF SCHOOL FACILITIES	X ₁ Y	X ₂ Y	X ₁ X ₂	X ₁ ²	X ₂ ²	Y ²
	X ₁	X ₂	Y						
2017	118,950	33,018	156	18,556,200	5,150,808	3,927,491,100	14,149,102,500	1,090,188,324	24,336
2018	119,572	32,819	156	18,653,232	5,119,764	3,924,233,468	14,297,463,184	1,077,086,761	24,336
2019	119,717	27,598	107	12,809,719	2,952,986	3,303,949,766	14,332,160,089	761,649,604	11,449
2020	120,700	27,087	107	12,914,900	2,898,309	3,269,400,900	14,568,490,000	733,705,569	11,449
2021	129,643	27,037	108	14,001,444	2,919,996	3,505,157,791	16,807,307,449	730,999,369	11,664
2022	129,704	29,363	108	14,008,032	3,171,204	3,808,498,552	16,823,127,616	862,185,769	11,664
	738,286	176,922	742	90,943,527	22,213,067	21,738,731,577	90,977,650,838	5,255,815,396	94,898
	ΣX_1	ΣX_2	ΣY	ΣX_1Y	ΣX_2Y	ΣX_1X_2	ΣX_1^2	ΣX_2^2	ΣY^2

Source: Author

Furthermore, the data from the table above is processed manually using the following formula:

$$r_{yx_1} = \frac{n \sum X_1 Y - (\sum X_1)(\sum Y)}{\sqrt{\{n(\sum X_1^2) - (\sum X_1)^2\} \{n(\sum Y^2) - (\sum Y)^2\}}}$$

From the calculation results $r_{yx_1} = -0.553383391$

$$r_{yx_2} = \frac{n \sum X_2 Y - (\sum X_2)(\sum Y)}{\sqrt{\{n(\sum X_2^2) - (\sum X_2)^2\} \{n(\sum Y^2) - (\sum Y)^2\}}}$$

From the calculation results $r_{yx_2} = 0.955051002$

$$r_{x_1x_2} = \frac{n \sum X_1 X_2 - (\sum X_1)(\sum X_2)}{\sqrt{\{n(\sum X_1^2) - (\sum X_1)^2\} \{n(\sum X_2^2) - (\sum X_2)^2\}}}$$

From the calculation results from $r_{x_1x_2} = -0.431933896$

Then from the calculation results above, the data is entered into the formula as follows:

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

The calculation results show that $r_{yx_1x_2} = 0.96773773$

This r becomes the basis for subsequent calculations to obtain a calculated F which will be the result of the correlation test by looking at the results of the comparison with the F table. The following formula is used to get the F count as follows:

$$F_h = \frac{\Gamma^2 / k}{(1 - \Gamma^2) / (n - k - 1)}$$

Then we can see that the result of F count = 22.12811775

The calculated F results are then compared with F tables where the basic hypothesis decision-making is as follows:

- Ho : no significant relationship between X1, X2, and Y
- Ha : there is a significant relationship between X1, X2, and Y

The hypothesis testing criteria are

- Ho is rejected if the calculated F value > from the F table
- Ho is accepted if the calculated F value is < from the F table

Table4 F table

df untuk penyebut (N2)	df untuk pembilang (N1)									
	1	2	3	4	5	6	7	8	9	10
1	161	199	216	225	230	234	237	239	241	242
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38	19.40
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.06
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.35
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.14
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98

Source: Homogeneity test

From the comparison of F count > F table, it can be concluded that there is a significant relationship between X1, X2, and Y. And this forms the basis for further research in estimating the need for educational facilities by using population growth rate data to be able to estimate the need for educational facilities with projections next 10 years.

3.2. Estimated Needs for Educational Facilities in the Next 10 Years

In general, the coverage area for each school is also determined by factors such as land use, school-age population density, and housing density(Kaiser, Godschalk, & Chapin Jr., 1995). Based on these data, we can estimate the rate of population growth in each research area if it is projected for the next 10 years. The projection calculation itself uses a geometric formula where population growth is calculated by calculating compound interest for growth (interest rates).

$$Mr= Po (1 + r)^n$$

From the results of the calculation above, we can see that there will be an increase in population as shown in the following table:

Table5 Estimated population growth

NO	RESIDENT	CISAAT DISTRICT									
		2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
1	Total population	129,704	131,338	132,993	134,669	136,366	138,084	139,824	141,586	143,369	145,176
2	Population density per km2	5,997	6,073	6,149	6,227	6,305	6,384	6,465	6,546	6,629	6,712
3	Population growth rate	1.26%	1.26%	1.26%	1.26%	1.26%	1.26%	1.26%	1.26%	1.26%	1.26%
NO	RESIDENT	SURADE DISTRICT									
		2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
1	Total population	2,173	83,225	84,290	85,369	86,462	87,568	88,689	89,825	90,974	92,139
2	Population density per km2	696	705	714	723	732	742	751	761	771	780
3	Population growth rate	1.28%	1.28%	1.28%	1.28%	1.28%	1.28%	1.28%	1.28%	1.28%	1.28%

Source: Author

From the estimated data above, we can estimate that in 2031 the population in Cisaat District will increase to 145,176 people, meanwhile, in Surade District it will increase to around 92,139 people. From this data, we then make a table of the growth in the number of students based on population growth data, as we can see in the following table:

Table6 Estimated growth in the number of pupils by the level of education

NO	SCHOOL TYPE	CISAAT DISTRICT									
		2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
1	SD	10,570	10,475	10,607	10,741	10,876	11,013	11,152	11,292	11,435	11,579
2	SMP & MTs	7,512	7,798	7,896	7,996	8,096	8,199	8,302	8,406	8,512	8,620
3	SMA, SMK & MA	6,808	7,140	7,230	7,321	7,413	7,507	7,601	7,697	7,794	7,892
NO	SCHOOL TYPE	SURADE DISTRICT									
		2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
1	SD	6,879	6,838	6,926	7,014	7,104	7,195	7,287	7,380	7,475	7,570
2	SMP & MTs	2,301	3,966	4,017	4,068	4,120	4,173	4,226	4,281	4,335	4,391
3	SMA, SMK & MA	2,794	3,913	3,963	4,014	4,065	4,117	4,170	4,223	4,277	4,332

Source: Author

3.3. Education Planning Standards

We will then compare the data on the number of students with the study group standard (Rombel) based on Permendikbud No. 17 of 2017 (Indonesia, 2017) and SE of the Minister of Education and Culture No. 3 of 2017 which discusses the Acceptance of New Students at the Kindergarten, Elementary School (SD), Junior High School (SMP), Senior High School, Vocational High School (SMK) education levels, or other equivalent forms. One of the main things regulated and discussed in the Permendikbud is the number of students in one study group (group) and also the number of classes in each school.

Table7 Standard Number of students per study group

NO	TYPE OF EDUCATION	NUMBER OF STUDENTS	
		MINIMUM	MAXIMUM
1	SD	20	28
2	JUNIOR HIGH SCHOOL	20	32
3	SENIOR HIGH SCHOOL	20	36
4	SMK	15	36

Source: Permendikbud number 17 of 2017

So based on the data above, we can estimate that the number of study groups seen from the number of students and the number of schools is as follows:

Table8 Average number of classrooms per school

NO	TYPES OF SCHOOLS IN CISAAT DISTRICT IN 2022	the number of students	number of schools	number of classes	the average
					number of classes per school
1	SD	10,570	42	440	10
2	SMP & MTs	7,512	30	289	10
3	SMA, SMK & MA	6,808	21	255	12
NO	TYPE OF SCHOOL IN SUB-DISTRICT SURADE IN 2022	the number of students	number of schools	number of classes	the average
					number of classes per school
1	SD	6,879	46	287	6
2	SMP & MTs	2,301	9	89	10
3	SMA, SMK & MA	2,794	6	104	17

Source: Author

From the results of the data processing above, we can see that on average there are more classrooms in each elementary school and junior high school in Cisaat District than there are more elementary and junior high school classrooms in Surade District. This is inversely proportional to classrooms for the high school level where high school level education facilities in the Surade sub-district are only available in 6 schools, so each school requires an average of 17 classrooms, while for the Cisaat sub-district each high school level school has an average of only 12 rooms. class. The need for classrooms for the next 10 years, namely in 2031, is as follows:

Table9 Estimated need for classrooms in 2031

NO	TYPES OF SCHOOLS IN CISAAT DISTRICT IN 2031	Estimated number of students in 2031	number of classes required	number of classes in 2022	additional classroom space needed

1	SD	11,579	482	440	42
2	SMP & MTs	8,620	332	289	43
3	SMA, SMK & MA	7,892	295	255	41
NO	TYPE OF SCHOOL IN SURADE DISTRICT IN 2031	Estimated number of students in 2031	number of classes required	number of classes	additional classroom space needed
1	SD	7,570	315	287	29
2	SMP & MTs	4,391	169	89	80
3	SMA, SMK & MA	4,332	162	104	57

Source: Author

From the results of the data processing above, we can see that for the Cisaat District for the next ten years, an additional ± 125 classrooms were required for all levels of education, while for the Surade sub-district, an additional ± 167 classrooms were required for all levels of education.

4. CONCLUSION

Additional classrooms in education facilities must be planned and prepared to accommodate the growing number of students. Implementation of the development can be done in stages every year. The addition of classrooms can be carried out at existing schools or can be done by creating new schools taking into account the scope of services of the school. The participation of the private sector in the provision of educational facilities is also expected to help the government which has limited budgets. It is hoped that the results of this study can become material for further research, especially related to the distribution of educational locations and the scope of school services, making it easier for the public to access educational facilities.

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