# MAPPING JUNIOR HIGH SCHOOL EDUCATION FACILITIES IN BOGOR: A COMPREHENSIVE STUDY

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#### **ABSTRACT**

This study on the distribution pattern of junior high school facilities in Bogor Regency, Indonesia, emphasizes the importance of addressing distribution inequalities. Through mapping and quantitative analyses, the research reveals a clustered distribution with a Z-Score of -21.83 and Nearest Neighbor Ratio of 0.66, emphasizing the need for equitable access to quality education. The study underscores the impact of road accessibility on service availability, highlighting the imperative to develop infrastructure. Recommendations include measures to ensure a well-rounded and accessible junior high school education, aligning with the mandate of Law No. 24/2007 for equitable distribution of educational facilities.

**Keywords**: study, mapping, distribution pattern, education facilities, junior high school.

## 1. INTRODUCTION

Population growth and the provision of public service facilities have a close relationship, because the increasing number of residents, the availability of service facilities must also be able to fulfill in order to support the social and economic activities of residents in an area. Population growth causes the need for social and economic service facilities, especially for educational facilities, to increase (Aprilia et al., 2021). The need for educational facilities is increasing because the number of children of school age is also increasing. The increase in educational facilities and infrastructure has been regulated in Permendiknas Number 24 of 2007 concerning Educational Facilities and Infrastructure Standards, because the fulfillment of educational facilities and infrastructure has an important role in the implementation of teaching and learning activities in each school (Kemendikbud, 2007). This is also in accordance with the mandate stipulated in Government Regulation (PP) Number 19 of 2005 concerning National Education Standards where each educational institution needs to regulate the need for supporting facilities such as classrooms, laboratories, and other learning media that support learning activities (Peraturan Pemerintah (PP) No. 19 Tahun 2005).

Education is the right of every citizen, which is clearly stated in the 1945 Constitution Article 31, because education is the basic foundation in developing the potential and quality of

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Society (Undang-Undang Dasar 1945 Pasal 31, 1945). The same thing is stated in Indonesian Law No. 21 of 2003, namely in article 5 paragraph 1, which explains that "every citizen has the same right to obtain quality education", then in article 1 paragraph 11 explains that "Formal education is a structured and tiered education path consisting of basic education, secondary education, and higher education." These articles explain that every citizen at school age without exception, aged 7-15 years, has the right to obtain and pursue formal or informal tiered education from primary, secondary and higher education (Undang-Undang Nomor 20 Tahun 2003).

Indonesian Law No. 20 of 2003 in article 4 paragraph 6 on the principles of education states that "Education is organized by empowering all components of society through participation in the implementation and control of the quality of education services". about the rights and obligations of parents and the government are contained in article 7 paragraph 2, namely "Parents of children of compulsory education age are obliged to provide education to their children", then in article 41 explains that "The Government and Regional Governments are obliged to facilitate education units with educators and education personnel needed to ensure the implementation of quality education." with this law in the implementation of education, it is hoped that the role of parents and the government will provide or facilitate education for school-age children (Undang-Undang Nomor 20 Tahun 2003).

The development of education in Indonesia should pay more attention to the facilities and infrastructure available in schools that affect the quality of education in the school. The equitable distribution of schools in an area can be identified from the pattern of school distribution. It affects the range of services of a facility in schools in each region. The uneven distribution of services and distribution of education will cause various problems, such as a shortage of students or the number of schools serving students from outside the usual area (Aprilia et al., 2021). Therefore, to support the running of learning and teaching activities, it is necessary to fulfill the facilities and infrastructure for learning activities in each school with the aim of increasing students' interest in learning so that they can achieve learning objectives.

According to (Amaliah, 2015) The success of the education development program can be seen from various indicators including the education participation rate, including the level of population participation in accessing education programs, which consists of: (a) School Participation Rate (APS), (b) Pure Participation Rate (APM), and (c) Gross Participation Rate (APK), which shows the participation of the population who are pursuing education according to their level of education, student ratio, and the number of classes or schools which shows how far the number of classes or schools has met the level of need.

Bogor Regency with an area of 2,710 km2 and a total of 228,926 students has a potential distribution that needs to be considered considering the area and the large number of residents in Bogor Regency makes the need for educational facilities also increase and the possibility of irregular distribution (BPS Kab. Bogor, 2023). The need for educational facilities in the Regency itself is one of the authorities and affairs of the Bogor Regency Regional Government so that in the organization and management of school facilities in accordance with the national standards of education the local government must participate in its management (PEMDA Kab.

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Bogor, 2008). This research was conducted to obtain a plan about the level of education in Bogor Regency. This was done for the success of the program implemented to produce quality and competitive human resources that can be known through the achievement of the Human Development Index (HDI) of around 12.48 years and Expected Years of Schooling (HLS) of around 8.30 years in Bogor Regency.

Based on the above background, the formulation of this research problem is as follows, first, what is the distribution pattern of junior high schools in Bogor Regency? Second, what is the availability and service of junior high school education facilities in Bogor Regency? Third, what are the development needs of junior high schools in Bogor Regency?

The results of this study are expected to determine the distribution pattern of junior high school education facilities in Bogor Regency, namely uniform, grouped, or random. In addition, this research is expected to determine the availability of services and the need for development of junior high school education facilities in Bogor Regency. So that later suggestions can be formulated to be used for proposals to the government in the development and implementation of education, especially at the junior high school level.

### 2. RESEARCH METHODS

The research method uses quantitative and qualitative approaches. To determine the distribution pattern of junior high school education facilities using *nearest neighbor* analysis techniques. Meanwhile, to determine the range of services using Geographic Information System (GIS) *buffering* analysis techniques and descriptive analysis. Data sources are secondary and primary data.

The units analyzed are 1) The distribution pattern of junior high schools in Bogor Regency, 2) The availability of junior high school education service facilities in Bogor Regency, and 3) The need for junior high school development in Bogor Regency. Secondary data was obtained from books, scientific articles, data collected and published by the Central Bureau of Statistics (BPS), Ministry of Education and Culture (MoEC), Ministry of Religious Affairs (MoRA), as well as Sekolah Kita and Pentakab Bogor web data, while primary data was in the form of questionnaires.

#### 3. RESULTS AND DISCUSSION

# 3.1. Respondent Overview

Bogor Regency is located between -  $6^{\circ}$  18' North latitude (LU) and -  $6^{\circ}$  47' South latitude (LS) and between  $106^{\circ}$  01'-  $107^{\circ}$  103' East longitude (BT). Bogor Regency has an area of 2,986.20 km<sup>2</sup> which is divided into 40 sub-districts and 435 villages or sub-villages (BPS Kab. Bogor, 2023). Bogor Regency is surrounded by several districts and cities as shown in *Figure I* Based on its geographical position, Bogor Regency has the following boundaries:

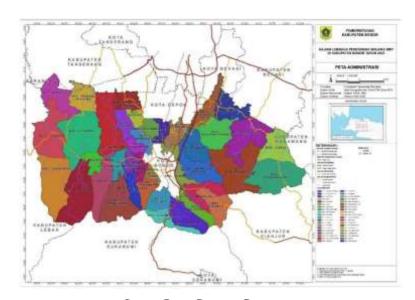
1. South : Cianjur Regency and Sukabumi Regency; and South Tangerang City (Banten Province), Bekasi City, Bekasi Regency and Depok City;

2. West : Lebak Regency, Banten Province;

3. East side : Karawang Regency, Purwakarta Regency and Cianjur Regency; Northeast,

Bekasi Regency.

4. Central part: Bogor City, West Java Province



Source: Bogor Regency Government

Figure 1. Bogor Regency Administration Map

## 3.2. School APK and APM in Bogor Regency

Educational facilities are very important in improving the quality of human resources, especially school age from 7-15 years old. For the implementation of this education development program, it is necessary to have a percentage of participation in the involvement of individuals who are taking education according to their level of education in Bogor Regency. the success of the program can be seen from several indicators, namely the School Participation Rate (APS), Pure Participation Rate (APM), and Gross Participation Rate (APK).

The calculation of the community school participation rate for junior high school education in Bogor Regency is calculated on the basis of the ratio of the number of school students and the number of individuals of primary school age, namely 13-15 years old. More details can be seen in *Table 1 and Figure 2. The* APK participation of junior high school in Bogor Regency in 2021 is at 70.61% while the APM value in 2021 participation reaches 52.93%. According to (Aziz, 2018) a high APK indicates a high level of school participation. If the APK value is close to or more than 100 percent, it can indicate that the region is able to accommodate more than the actual target school-age population. This means that Bogor Regency is sufficient in the fulfillment of school facilities or this region and has accommodated the school-age population, especially SMP 13-15 years.

Education Study Tendik **Status** No. Level Learners **Educator** Classroom Unit Group Country 1.537 461.509 15.285 3.380 14.956 11.763 Elementary Private 4.501 3.481 3.439 1 346 83.774 967 School 15.202 Total 1.883545.283 19.786 4.347 18.437 Country 106 92.924 3.107 927 2.427 2.330 Junior 2 High School Private 645 136.002 6.550 1.828 4.489 5.028 Total 751 228.926 9.657 2.755 6.916 7.358

Table 1. Number of Schools in Bogor Regency

Source: Education in Bogor District Data

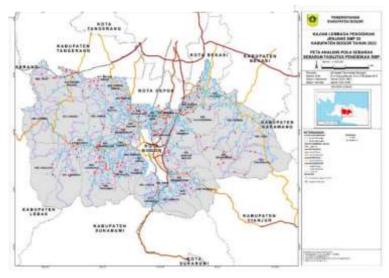


Source: https://apkapm.data.kemdikbud.go.id/

**Figure 2.** (1) Graph of Gross Enrollment Rate (APK) and Net Enrollment Rate (APM) of Schools in Bogor Regency Gross Enrollment Rate (APK); (2) Net Enrollment Rate (APM)

# 3.3. Analysis of the Distribution Pattern of Junior High Schools in Bogor Regency

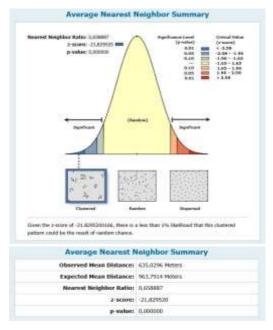
One of the objectives of this research is to find the distribution pattern of junior high school education facilities in Bogor Regency. Determining the distribution pattern of junior high school education facilities by using spatial analysis of a Geographic Information System (GIS) technology tool data processing using ArcGIS software with *Average Nearest Neighbor* analysis tools. For more details can be seen in *Figures 3 and 4*.



Source: Data Processing Results, 2023

Figure 3. Map analyzing the distribution pattern of education facilities in Bogor Regency

Based on the results of observations, it was found that the number of junior high schools in Bogor Regency was 1119 junior and senior high schools, the results of the analysis showed a *Clustered* distribution pattern. This distribution pattern is said to be Clustered because it has a Critical Value (*Z-Score*) value of -21.829520. then the analysis results show a Nearest Neighbor Ratio value of 0.658887 with an average distance between SMP Education Facilities of 963.7 meters. From the results of data processing coordinates of junior high school education facilities in Bogor Regency, there are 1,119 points of junior high school education facilities spread across the Regency which are centered on the district city center, can be seen in Figure 3.



Source: Data Processing Results 2023

Figure 4. Results of Analysis of Distribution Patterns of Education Facilities in Bogor Regency

The pattern of school distribution in the sub-districts in Bogor Regency is very diverse. In this Average Nearest Neighbor analysis, there are three categories of distribution pattern results, namely *dispersed*, *random*, and *clustered*. Among them, 19 sub-districts in Bogor Regency have a *random pattern*, 16 sub-districts in Bogor Regency have a *dispersed pattern*, and 5 sub-districts in Bogor Regency have a *clustered* pattern. Or more details can be seen in *Table 2*.

Table 2. Analysis of the Distribution Pattern of Education Facilities in Bogor Regency

No.	District	Number of Schools	Distribution Pattern	No.	District	Number of Distribution Schools Pattern		
1	Babakan Madang	23	Random	21	Jonggol	41	Clustered	
2	Bojonggede	57	Random	22	Kemang	31	Clustered	
3	Caringin	41	Random	23	Klapanunggaal	23	Clustered	
4	Cariu	12	Dispersed	24	Leuwiliang	37	Random	
5	Ciampea	28	Dispersed	25	Leuwisadeng	23	Random	
6	Ciawi	25	Random	26	Megamendung	22	Clustered	
7	Cibinong	77	Random	27	Nanggung	16	Dispersed	
8	Cibungbulang	40	Random	28	Pamijahan	42	Random	
9	Cigombong	22	Random	29	Parung	25	Dispersed	
10	Cigudeg	27	Random	30	Parungpanjang	27	Random	
11	Cijeruk	20	Dispersed	31	Rancabungur	17	Dispersed	
12	Cileungsi	48	Random	32	Rumpin	27	Random	
13	Ciomas	20	Random	33	Sukajaya	9	Dispersed	
14	Cisarua	14	Dispersed	34	Sukamakmur	23	Dispersed	
15	Ciseeng	31	Random	35	Sukaraja	22	Dispersed	
16	Citeureup	38	Random	36	Tajurhalang	32	Dispersed	
17	Dramaga	12	Dispersed	37	Tamansari	15	Dispersed	
18	Gunungputri	25	Clustered	38	Tanjungsari	14	Dispersed	
19	Gunung Sindur	60	Dispersed	39	Tenjo	17	Random	
20	Jasinga	17	Random	40	Tenjolaya	19	Dispersed	
					Bogor Regency	1.119	Clustered	

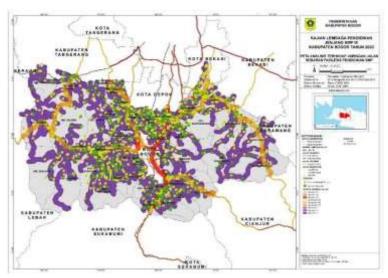
Source: Analysis Result, 2023

# 3.4. Analysis of Educational Facilities (SMP) on the Road Network

The analysis of the affordability of educational service facilities at the junior secondary school level was carried out using the GIS modeling method by looking at the reach of a service to the optimal distance to reach the road network service To see this affordability, spatial analysis (buffering) was used.

The location of junior high schools in Bogor Regency is predominantly on local roads with 796 units or 71.1%, while the location of infrastructure facilities on arterial roads with 64 units or 5.72% and collectors 259 units or 23.71% is only partial, but access to local locations is still easy to reach. The location of junior high school education facilities depends on accessibility factors in the form of road networks and the distance traveled by the community in reaching an

education service, especially the junior high school level in Bogor Regency. For more details, see *Figure 5*.



Source: Data Processing Results 2023

Figure 5. Map of Road Network to Junior High School Education Facilities in Bogor District

# 3.5. Analysis of the availability of junior secondary education service facilities

# a) SMP Needs Analysis Based on Urban SNI - Total Population Supporting Sub-districts

The results of the analysis of the needs of junior high school education facilities in Bogor Regency based on the Indonesian National Standard (SNI) Urban using the total population per sub-district in Bogor Regency, obtained the results of 2 (two) sub-districts that have met the needs, namely Cijeruk District and Gunung Sindur District. Then, there are 18 (eighteen) sub-districts that still lack junior high school education facilities and there are 20 (twenty) sub-districts that have exceeded the total number of facilities. The results of the analysis of the needs of junior high school education facilities in Bogor Regency using the number of school-age population (13-15) per sub-district in Bogor Regency, obtained the results of 5 (five) sub-districts that have met the needs, namely Cariu District, Cijeruk District, Ranca Bungur District, Sukajaya District and Sukamakmur District. Then, there are 35 (thirty-five) sub-districts that have exceeded the total number of facilities. For more details, please refer to *Table 3*.

**Table 3**. Educational Facility Needs for Junior High School in Bogor Regency Based on Urban SNI - Subdistrict Support Population and Junior High School Needs Based on School Age Population (13-15, 2023)

No.	District	Number of Supporting Population	Total Subdistrict Population 2022	_	Number of junior high	Population / Total	School Needs Based on SNI- Population	School Needs Based on SNI-School A Age Population
		A	В	D	$\mathbf{F}$	B/A	(B/A)-F	(D/A) - F
1	Babakan	4.800	119.231	2.473	23	25	-2	22

No.	District	Number of Supporting Population	Total Subdistrict Population 2022		Number of junior high	Population / Total	Needs Based on SNI- Population	SNI-School
	Madang							
2	Bojong Gede	4.800	263.642	8.668	57	55	2	55
3	Caringin	4.800	136.443	3.036	41	28	13	40
4	Cariu	4.800	54.077	1.565	12	11	1	12
5	Ciampea	4.800	173.460	3.576	28	36	-	27
6	Ciawi	4.800	116.779	5.356	25	24	8	24
7	Cibinong	4.800	361.127	14.232	23 77	75	1 2	2 <del>4</del> 74
8	Cibungbulang	4.800	148.531	6.390	40	31	9	74 39
		4.800	100.390	4.786	22	21		21
9 10	Cigombong	4.800	140.407	3.214	27	29	1	26
10	Cigudeg	4.800	140.407	3.214	21	29	2	20
11	Cijeruk	4.800	95.076	2.047	20	20	0	20
12	Cileungsi	4.800	269.651	12.662	48	56	-8	45
13	Ciomas	4.800	160.702	4.633	20	33	-13	19
14	Cisarua	4.800	130.552	3.863	14	27	-13	13
15	Ciseeng	4.800	118.758	3.504	31	25	6	30
16	Citeureup	4.800	219.520	7.019	38	46	-8	37
17	Dramaga	4.800	110.624	3.620	12	23	-11	11
18	Gunung Sindur	4.800	118.581	5.714	25	25	0	24
19	Gunung Putri	4.800	291.673	9.359	60	61	-1	58
20	Jasinga	4.800	111.350	3.554	17	23	-6	16
21	Jonggol	4.800	145.032	6.458	41	30	-11	40
22	Kemang	4.800	108.056	6.888	31	23	-8	30
23	Klapanunggal	4.800	125.641	3.231	23	26	3	22
24	Leuwiliang	4.800	131.352	4.583	37	27	10	36
25	Leuwisadeng	4.800	81.557	3.703	23	17	6	22
26	Megamendung	4.800	112.387	3.730	22	23	-1	21
27	Nanggung	4.800	99.485	2.030	16	21	-5	16
28	Pamijahan	4.800	163.186	5.943	42	34	8	41
29	Parung	4.800	126.689	5.700	25	26	-1	24
	Parungpanjang	4.800	122.963	4.058	27	26	1	26
31	Ranca Bungur	4.800	61.808	2.272	17	13	4	17
32	Rumpin	4.800	153.211	3.791	27	32	-5	26
33	Sukajaya	4.800	70.078	1.663	9	15	-6	9
34	Sukamakmur	4.800	89.647	1.970	23	19	4	23
35	Sukaraja	4.800	199.452	4.031	22	42	-20	21
36	Tajurhalang	4.800	122.489	4.730	32	26	6	31
37	Tamansari	4.800	111.034	3.869	15	23	-8	14
38	Tanjung Sari	4.800	60.499	1.927	14	13	1	14
39	Tenjo	4.800	77.489	2.823	17	16	1	16
40	Tenjolaya	4.800	67.678	2.442	19	14	5	18





Source: Analysis Results, 2023

# b) SMP Needs Analysis Based on the Number of School Age Population (13 - 15, 2023)

The results of the analysis of the needs for junior high school education facilities in Bogor Regency based on the capacity of junior high school - elementary school graduates per sub-district in Bogor Regency, obtained the results of 18 (eighteen) sub-districts that are still lacking and need junior high school education facilities and 22 (twenty-two) sub-districts that have exceeded the total number of facilities. For more details can be seen in *Table 4*.

Table 4. Junior High School Needs Based on Capacity - Primary School Graduates Kabupaten Bogor

No.	District	Capacity	Elementary school gradua	(Capacity - Number of te Primary School Graduates)	Description	Number of Class Needs (Number of Students Less / Number of Standard 1 Rombel)
		A	В	A-B		
1	Babakan Madang	1.256	2.156	-900	Less	45
2	Bojong Gede	3.728	3.968	-240	Less	12
3	Caringin	1.544	1.413	131	More	
4	Cariu	616	678	-62	Less	3
5	Ciampea	1.886	2.275	-389	Less	19
6	Ciawi	2.304	1.752	552	More	
7	Cibinong	5.908	5.869	39	More	
8	Cibungbulang	3.141	1.926	1215	More	
9	Cigombong	2.181	1.830	351	More	
10	Cigudeg	1.483	2.181	-698	Less	35
11	Cijeruk	1.089	1.499	-410	Less	21
12	Cileungsi	5.693	5.434	259	More	
13	Ciomas	2.036	1.962	74	More	
14	Cisarua	1.637	2.008	-371	Less	19
15	Ciseeng	1.595	1.913	-318	Less	16
16	Citeureup	3.175	3.357	-182	Less	9
17	Dramaga	1.568	1.625	-57	Less	3
18	Gunung Sindur	2.427	1.865	562	More	
19	Gunung Putri	4.159	5.435	-1276	Less	64
20	Jasinga	1.581	2.118	-537	Less	27
21	Jonggol	2.900	2.381	519	More	
22	Kemang	3.162	1.853	1309	More	
23	Klapanunggal	1.642	2.020	-378	Less	19
24	Leuwiliang	5.075	1.848	3227	More	
25	Leuwisadeng	1.785	982	803	More	
26	Megamendung	1.774	1.744	30	More	
27	Nanggung	906	1.434	-528	Less	26
28	Pamijahan	2.867	1.903	964	More	
29	Parung	2.933	1.715	1218	More	
30	Parungpanjang	2.042	2.040	2	More	
31	Ranca Bungur	1.025	976		More	
32	Rumpin	1.839	2.745		Less	45
33	Sukajaya	1.011	1.023	-12	Less	1
34	Sukamakmur	948	1.253		Less	15
35	Sukaraja	1.887	2.371	-484	Less	24
36	Tajurhalang	2.068	1.593	475	More	

37	Tamansari	1.722	1.450	272	More	
38	Tanjung Sari	867	742	125	More	
39	Tenjo	1.388	1.266	122	More	
40	Tenjolaya	1.075	739	336	More	
Total	87.923	83.342	-			

Source: Analysis Result, 2023

### c) Junior High School Development Needs

The results of the analysis of the needs of junior high school education facilities in Bogor Regency were obtained through primary data, namely by filling out a questionnaire filled out by representatives from each sub-district in Bogor Regency. Based on the results of the questionnaire, several main indicators were obtained consisting of factors, namely:

- 1. Governance Issues and Concerns.
- 2. Prioritization of Facilities and Infrastructure Provision,
- 3. Priority Program for Quality and Quality Improvement,
- 4. Character Education Priority Program, Governance Priority Program, and
- 5. Suggestion.

In determining the value of indicators based on factors in each indicator to describe the problems that exist in junior high school education facilities in Bogor Regency. The development then obtained strategic priorities and several points for development activities such as fulfilling and improving the quality of facilities and infrastructure, increasing the human resources of teaching staff, character building is needed, new schools need to be built, and there is a need to improve access to schools.

## 4. CLOSING

Equitable distribution of educational facilities is very important because education is a basic thing that must be obtained, all Indonesian citizens have the right to obtain every citizen with proper and quality as stated in Law No. 24 of 2007 concerning minimum standards of educational facilities and infrastructure. Bogor Regency has 1,119 junior high school education facilities spread across each sub-district in Bogor Regency, both junior high schools and MTs.

Based on the nearest neighbor average analysis, junior high school education facilities in Bogor Regency have a *clustered* distribution pattern with a Critical Value (Z-Score) of -21.829520, a Nearest Neighbor Ratio value of 0.658887, and an average distance between junior high school education facilities of 963.7 meters. Junior high school education facilities in each sub-district in Bogor Regency vary from 40 sub-districts, including 19 sub-districts with random distribution patterns, 16 sub-districts with dispersed distribution patterns, and 5 sub-districts with clustered distribution patterns,

The analysis of the number of needs and services of junior high school education facilities in Bogor Regency is divided into three, namely based on SNI, population aged 13-15, and capacity. Based on urban SNI, the results obtained there are 18 sub-districts that are still lacking, 2 sub-districts have met, and 20 sub-districts exceed the fulfillment of the needs of junior high

school facilities in Bogor Regency. Based on the population aged 13-15 years, there are 5 sub-districts that have met and the remaining 35 sub-districts have exceeded the total number. Meanwhile, based on capacity and elementary school graduates, the results show that 18 sub-districts are still lacking and the remaining 22 sub-districts exceed the need for school facilities/buildings to fulfill junior high school education.

Based on the three analyses, a questionnaire was taken to obtain strategies and priorities for developing junior high school facilities in Bogor Regency. Based on the results of the questionnaire, several main indicators were obtained consisting of factors, namely issues and problems related to governance, priority provision of facilities and infrastructure, priority programs to improve quality and quality, priority programs for character education, priority programs for governance, and suggestions. From the indicator factors above, for further development, they are ranked based on strategic priorities. Some points for development activities are such as, fulfilling and improving the quality of facilities and infrastructure, increasing the human resources of teaching staff, character improvement is needed, new schools need to be built, and there is a need to improve access to schools.

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