

An Analysis of Public Schools Availability and Affordability in Small Islands (Case Study: Sabang Municipality)

Sendi Permana^{1*}, Novida Yenny¹, Darwin Parlaungan Lubis¹, M. Taufik Rahmadi¹, Della Amelia Milanda¹, Irson Nababan¹, Tria Maulia¹, Jennifer Halim²

¹Department of Geography Education, Universitas Negeri Medan, Medan, 20221, Indonesia

²Department of Urban and Regional Planning, Universitas Terbuka Medan, Medan, 20228, Indonesia

*Corresponding author: sendipermana@unimed.ac.id

ARTICLE INFO

Received :
3 March 2024

Revised :
20 November 2024

Accepted :
29 November 2024

Published :
27 December 2024

ABSTRACT

Based on geographical location, Sabang municipality is located in an archipelago far from big cities and has a relatively small population so that the fulfillment of educational facilities needs attention. This study aims to analyze and evaluate the availability and affordability of public elementary schools, junior high schools, and senior high schools in Sabang Municipality. This study uses quantitative and qualitative approaches (mix methods). The analysis of availability and affordability was carried out by calculating serviceability and buffering analysis based on normative reference and was completed with interviews with stakeholders of the Education Office. The results of the study show that for detailed availability, namely elementary schools, junior high schools, and senior high schools are all categorized as deficits, while for detailed affordability, namely, elementary schools are categorized as high, junior high schools are categorized as medium, and senior high schools are categorized as high. The government explained that the availability and affordability of public schools at the elementary schools, junior high schools, and senior high schools levels are adequate and accessible, especially equipped with transportation facilities. The conclusion shows that although this study focuses only on public schools so that it is found that the availability is still a deficit, on the other hand the location of the school can be reached, so it can be interpreted that the location of the school is strategic.

Keywords: Affordability; Availability; Public Schools; Small Islands

INTRODUCTION

One of the most important factors in a nation's development is education, especially the country's human resources. where facilities and infrastructure are one of the most important elements in an educational institution because they are one of the important resources in supporting the learning process (Ministry of Education and Culture, 2007). Therefore, a country is expected to meet the educational aspect, one of which is to ensure adequate educational facilities. Muhaimin et al. (2022) assert that future growth planning heavily depends on the caliber of service provided by urban service facilities, particularly schools.

Every school-age population should be guaranteed access to School, the government in this case should focus on fulfilling these three levels of education by seeking the availability of schools and considering the ideal location to make it easier for residents or students to reach them. According to Jażdżewska et al. (2022), very few students in elementary through secondary school prefer to attend school outside of their city; the majority of pupils exhibit a predisposition to choose the site closest to their home. Educational planning in this case also emphasizes the

distribution aspect so that educational services can be accessed optimally, especially in archipelagos such as Sabang municipality

Sabang municipality as the center of socio-economic development in the western tip of Indonesia is supported by the leading sector, namely tourism ([Government of Sabang City, 2012](#)). The detailed topographic composition of this area consists of 52% hilly to mountainous areas, 35% hilly areas, 10% undulating plains, and 3% lowlands ([BPS Kota Sabang, 2023](#)). Based on geographical conditions, Sabang municipality face challenges in regional development in terms to fulfillment of basic needs for the society, especially education facilities. According to [Susilo et al. \(2022\)](#), accessibility aspects are established by taking into account a variety of characteristics, including the area's topography or height, road network, transportation facilities' presence, and the area's distance or position.

According to [Muta'ali \(2015\)](#), the location of service centres can be grouped based on two important factors, namely the distance a person has to travel to obtain goods or services (range) and the minimum population required for the supply of goods to remain smooth and balanced (threshold). Therefore, the location of the placement of educational facilities is important so that the services provided are efficient and effective. As the basic data on the school participation rate, the data shows in detail, namely, elementary school is 99.75%, junior high school is 94.02%, and senior high school is 78.86% ([BPS Kota Sabang, 2023](#)). The participation rate shows a decrease in school participation at a higher level. Furthermore, [Ashik et al. \(2020\)](#) stated that while building a spatial environment, it is important to take into account both non-spatial factors like demography and spatial factors like location and accessibility.

Research on the availability and affordability of educational facilities has been done towards serviceability evaluation of education facilities ([Pranowo et al., 2023](#); [Raharjo et al., 2022](#); [Asmaradhana, 2021](#)), projection of the need for educational facilities ([Ibnu et al., 2023](#)), Affordability of facilities education ([Ayumi et al., 2022](#)), and School distribution ([Taufiq et al., 2023](#); [Sapakoly & Papilaya, 2023](#)). In addition, related research serviceability and affordability methods similar to solving existing problems. Availability and affordability at different location perspectives and different emphasis have been done as follows affordability of education facilities at mountainous areas ([Yao et al., 2022](#)), affordability of education facilities at rural area ([Mustar et al., 2022](#)), and education access equity review ([Muhaimin et al., 2022](#); [Sakti et al., 2022](#); [Wang et al., 2021](#)).

Based on several previous studies, this study seeks to explore the aspects of the availability and affordability of school facilities in urban areas on small islands with a focus on public education facilities. Technically, the unit of analysis used is the district so that the analysis of the availability and affordability of public education facilities at the elementary school, junior high school, and high school levels is carried out by comparing the existing conditions of educational facilities with the number of educational facilities and the ideal distance based on normative reference and validated based on stakeholder considerations. The hope of this study is to uncover the condition of service and reach of educational facilities and evaluate existing conditions through stakeholder considerations.

METHODS

This study was focused on Sabang Municipality, with a district unit of analysis. The districts at Sabang Municipality are Sukajaya, Sukakarya, and Sukamakmue. The choice of research location is based on the geographical characteristics of Sabang Municipality, which is located on a small island at the tip of Sumatra Island, so researchers are interested in exploring the level of fulfilment of education facilities at Sabang Municipality.

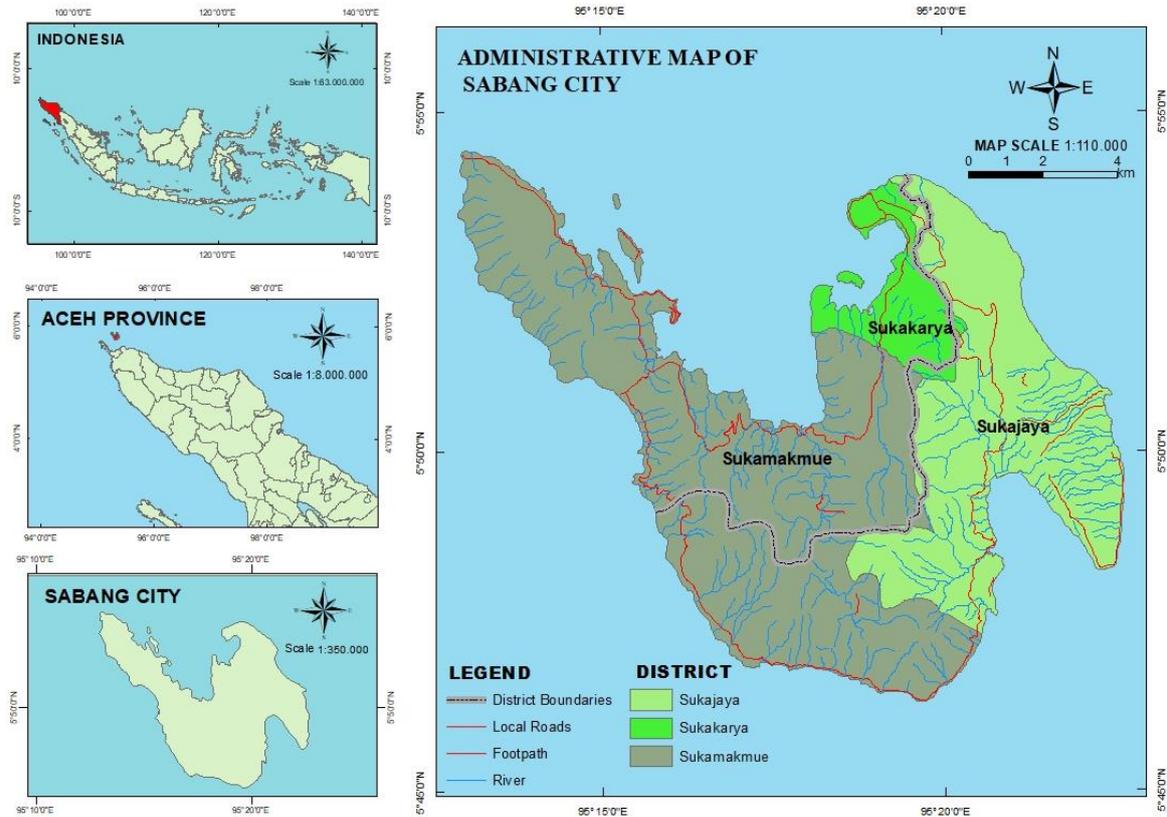


Figure 1. Administrative Map of Sabang Municipality

This study employed a combination strategy, or mix method; combining two approaches may be more beneficial than using just one, as it will probably yield deep insights into a phenomenon that cannot be fully comprehended by using either qualitative or quantitative methods alone (Dawadi et al., 2021). This research employs a combination strategy, or mix method; combining two approaches may be more beneficial than using just one, as it will probably yield deep insights into a phenomenon that cannot be fully comprehended by using either qualitative or quantitative methods alone (Razali et al., 2023). Expectations from the use of combination research produce more comprehensive and accurate data and conclusions.

There are 3 objectives in this study, detailed as follows: (1) to analyse the availability of public school facilities at the elementary, junior high, and senior high school levels, (2) to analyse the affordability of the location of public school facilities at the elementary, junior high, and senior high school, and (3) evaluating the availability and affordability of public schools at the elementary, junior high and high school levels. Based on the analysis and evaluation of availability and affordability, it is hoped that it can provide a comprehensive view of the fulfillment of educational facilities in the Sabang Municipality.

The population in the availability and affordability analysis study is all public schools at the elementary, junior high, and high school levels with sampling using the census method. All population members are utilised as samples, according to the census method's determination of the sample (Sukwika et al., 2023). The data collection is sourced from the inageoportale database in 2023, namely data on the number and location of public schools at the elementary, junior high, and high school levels. In addition, the informant related to the evaluation study of school availability and affordability was sourced from the government, namely the Sabang Municipality Education and Culture Office. The selected informants for the interview were taken using the snowball sampling method.

Finding one participant who is pertinent to the study is the first step in this process, and that participant should direct you to further participants who share their traits until the desired sample size is reached (Nyimbili & Nyimbili, 2024). Technically, sampling is based on one of the

selected informants, then the informant appoints another colleague, the data collection is stopped when the information obtained is relatively similar or even the same as the previous informant. The selection of informants used snowball sampling, and the results of the exploration were enough for four selected informants, namely the Staff for Early Childhood Education and Non-Formal Education Development, Elementary Education Development Staff, the Junior High School Supervisor, and the Middle School Supervisor.

We used the serviceability and affordability analysis of educational facilities. Serviceability is a calculation between the number of availability of educational facilities by comparing the number of population, while affordability is a calculation between the location of educational facilities and settlements. These two analyses refer to normative references, namely Procedures for Planning the Residential Environment in Urban Areas. If the value of serviceability and affordability exceeds the minimum service standards, the condition of serviceability and affordability will also be better.

Table 1. Minimum Service Standards for Educational Facilities ([Indonesia National Standart, 2009](#))

Education level	Population Threshold	Range
Elementary School	1600	1000 meter
Junior High School	4800	1000 meter
Senior High School	4800	3000 meter

Availability analysis formula according to [Muta'ali \(2015\)](#) is using 3 steps as follows:

$$(1) \text{ Minimum number of each education facilities level} = \frac{\text{Total population of each district}}{\text{Population threshold for each level of facilities education}}$$

$$(2) \text{ Serviceable of each education facilities level} = \frac{\text{Existing of each educational facilities level in each district}}{\text{Minimum number of each education facilities level}}$$

Note :

Serviceable = 1, There is a balance between the needs of the population and the existence of facilities (efficient)

Serviceable > 1, The existence of existing facilities has been able to support the needs of the population, and can be interpreted as a sufficient level of service (surplus)

Serviceable < 1, The existence of facilities has not been able to support the needs of the population, or there is a shortage of facilities (deficit).

The formula for affordability analysis according to [Rahmawati \(2024\)](#); [Megawati & Kurniawan, \(2023\)](#); [Rizal et al. \(2022\)](#) is using 3 steps as follows:

$$(1) \text{ Served area from minimum coverage for each education facilities level} = \frac{\text{locations for each educational facilities level in each district}}{\text{Range of each education facilities level to settlements}}$$

$$(2) \text{ Coverage Percentage from each education facility level} = \frac{\text{Settlements area that served by each level of education}}{\text{Existing area of settlements in each district}} \times 100\%$$

Based on this formula, the results of the percentage of coverage of educational facilities to settlements can be classified as follows:

0 % - 33,33 % = Low affordability

33,34 % - 66,66 % = Medium affordability

66,67 % - 100 % = High Affordability

Based on the analysis of availability and affordability that refers to normative standards and compared with existing conditions and then validated with considerations from the Sabang

Municipality Education Office stakeholders, this research is expected to provide a comprehensive view of the fulfilment of educational facilities at Sabang Municipality. The results of this study are expected to contribute to regional development policies, especially the fulfilment of education services.

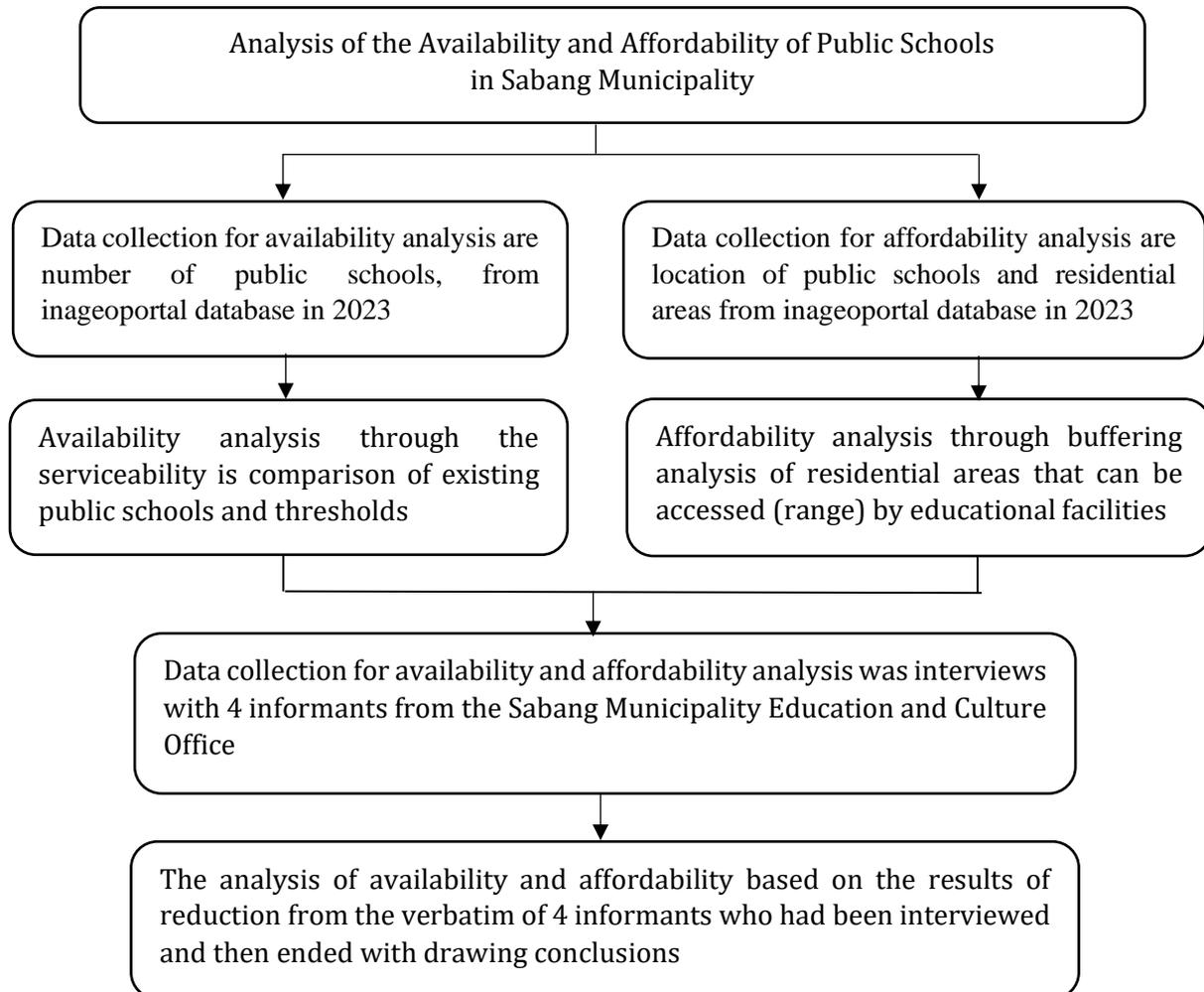


Figure 2. Research Framework

RESULTS AND DISCUSSIONS

Availability of Public School Facilities at the Elementary, Junior High School and Senior High School Levels at Sabang Municipality

The availability of educational facilities is based on the population threshold of each service facility. The population threshold for 3 levels of education is compared to the number of population and school existing in each district to produce school adequacy data, the detailed description as follows.

Availability of Public Elementary School at Sabang Municipality

Based on the population threshold for elementary facilities and compared to the existing conditions of schools, the distribution of serviceability by district unit is presented in Table 2 and Figure 3 as follows.

Table 2. Availability of Public Elementary Schools at Sabang Municipality

District Name	Total Population	Existing schools	Number of schools required	Serviceability	Category
Sukajaya	20590	8	13	0,62	Deficit
Sukakarya	13858	8	9	0,89	Deficit
Sukamakmue	8760	7	5	1,40	Surplus

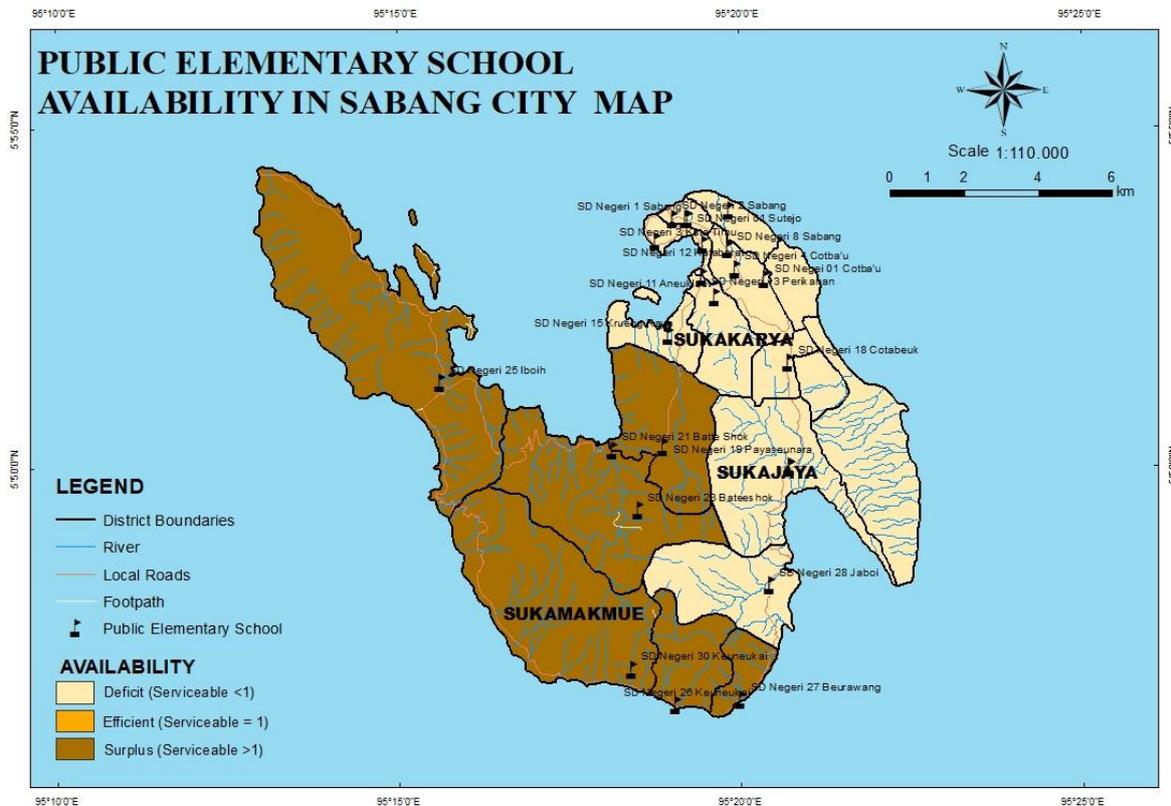


Figure 3. Availability Map of Public Elementary Schools at Sabang Municipality

Based on Table 2 and Figure 3 on the availability of public elementary schools at Sabang Municipality, it is known that public elementary schools at Sabang Municipality already exist in each village. The existence of public elementary school buildings in the district of Sukamakmue is categorized as surplus, but for two districts, namely Sukajaya and Sukakarya, the number of public elementary schools available is categorized deficit. Sukamakmue district has 7 public elementary school buildings, while the need is only 5 units, therefore it can be concluded that the number of public elementary school buildings is categorized as surplus. Sukakarya district has 8 units of public elementary school buildings, which is still not enough for the needs that require at least 9 school buildings. A more crucial condition is in Sukajaya district, which requires around 13 public elementary school buildings but only 8 buildings are available.

A study conducted in the United States highlights similar challenges in school availability, particularly in rural and sparsely populated areas. [Gutierrez and Terrones \(2023\)](#) found that rural districts frequently struggle with a mismatch between the demands of the community and the availability of school supplies; some, particularly in more populous or expanding areas, suffer from a lack of infrastructure, while others have an excess. Uneven funding and planning policies are usually to blame for this discrepancy, which results in either underutilised or overloaded school facilities.

Overall, the building units of public elementary schools in each district in Sabang Municipality are not fully adequate. This condition shows that elementary school facilities, which are ideally village level service facilities, do not seem to be well distributed at Sabang Municipality. Ideally, the number of elementary schools with a low service scale can be met according to the existing population. [Giyarsih & Amelia, \(2023\)](#) stated that the population's size is taken into account when developing service facilities, particularly health and educational facilities.

Availability of Public Junior High School at Sabang Municipality

Based on the population threshold for junior high school facilities and compared to the existing conditions of the school, the distribution of serviceability by district unit is presented in Table 3 and Figure 4.

Table 3. Availability of Public Junior High Schools At Sabang Municipality

District Name	Total Population	Existing schools	Number of schools required	Serviceability	Category
Sukajaya	20590	3	4	0.75	Deficit
Sukakarya	13858	1	3	0.33	Deficit
Sukamakmue	8760	4	2	2.00	Surplus

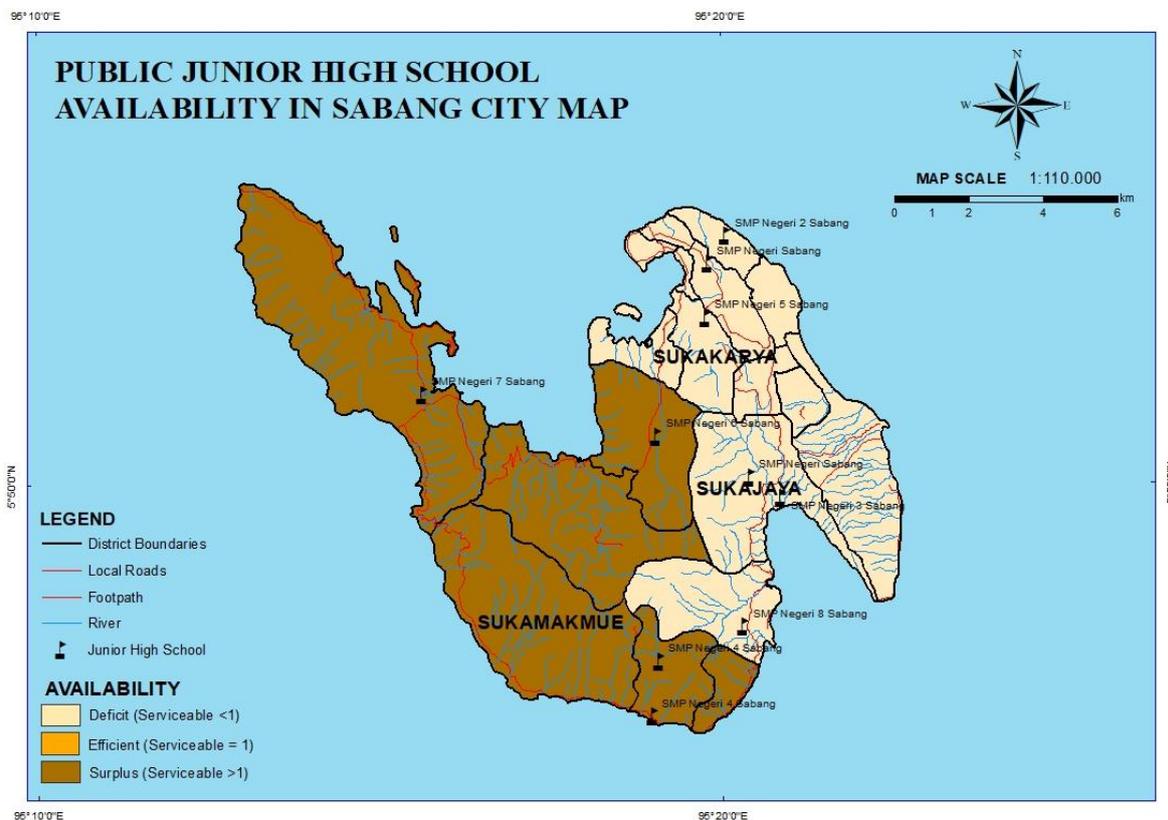


Figure 4. Availability Map of Public Junior High School levels at Sabang Municipality

Based on Table 3 and Figure 4, it can be seen that junior high school buildings already exist in each district at Sabang Municipality. The existence of public junior high school buildings in the district of Sukamakmue is categorized as surplus, but for two districts, namely Sukajaya and Sukakarya districts, the number of public junior high schools available is categorized deficit. Sukamakmue district has 4 public elementary school buildings, while the need is only 2 units, therefore it can be concluded that the number of public junior high school buildings is enough.

District Sukajaya has 3 units of public junior high school buildings, which is still not enough for the needs that require at least 4 school buildings. A more crucial condition is in Sukakarya district, which requires around 3 public junior high school buildings but only 1 building is available. A study by [Drescher et al. \(2022\)](#) highlights the differences in school buildings and resource distribution, pointing out that rural areas frequently have much smaller school systems than their urban counterparts, which exacerbates educational inequities.

Overall, there are not enough public junior high school buildings in each district at Sabang Municipality. This condition shows that junior high school facilities, which ideally are district level service facilities, do not seem to be well distributed at Sabang Municipality. As one of the vital levels of secondary education, of course, it is necessary to receive special treatment related to this condition. According to [He & Huang, \(2021\)](#), investigating educational disparity requires a precise evaluation of the amount or service capability of educational resources.

Availability of Public Senior High School at Sabang Municipality

Based on the population threshold for high school facilities and compared to the existing conditions of the school, the distribution of serviceability based on district units is presented in Table 4 and Figure 5.

Table 4. Availability of Public Senior High Schools at Sabang Municipality

District Name	Total Population	Existing Schools	Number of schools required	Serviceability	Category
Sukajaya	20590	1	4	0.25	Deficit
Sukakarya	13858	1	3	0.33	Deficit
Sukamakmue	8760	0	2	0,00	Deficit

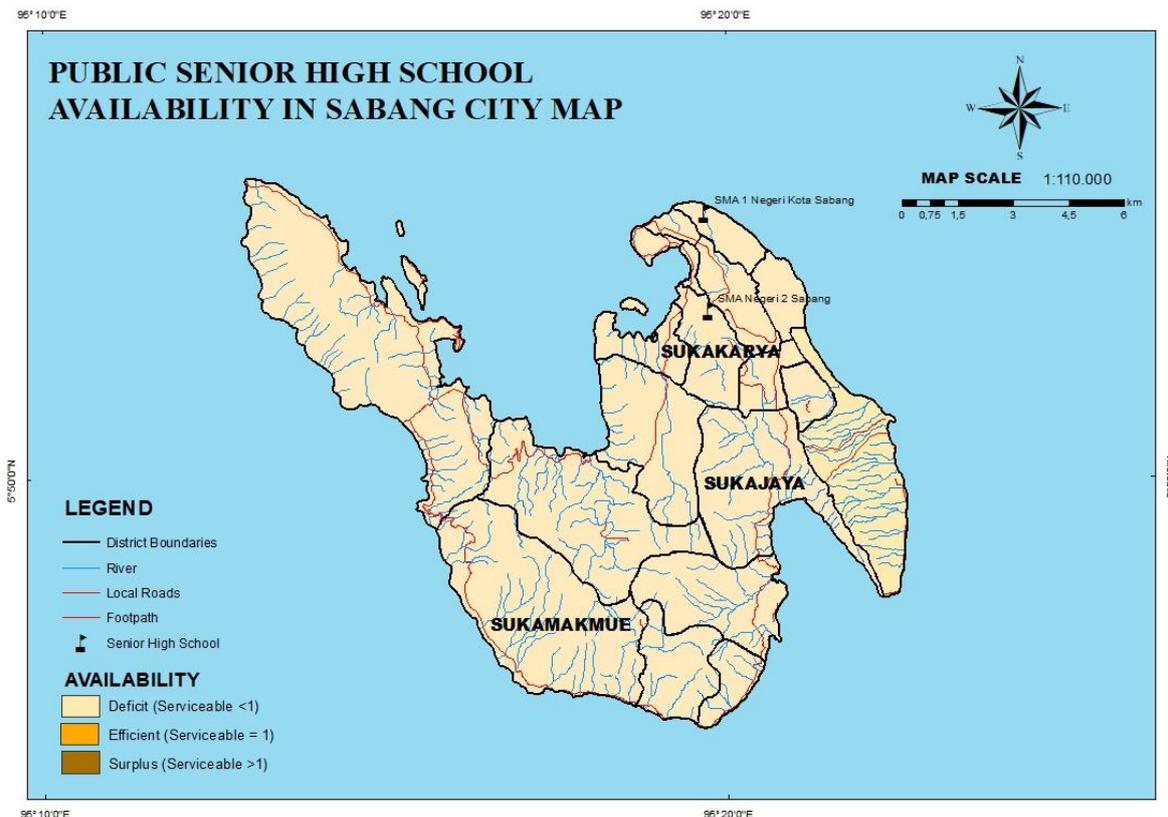


Figure 5. Availability Map of Public Senior High School levels at Sabang Municipality

Based on Table 4 and Figure 5 about the availability of public high schools in Sabang Municipality, it is known that the number of public high school facilities in Sabang Municipality is categorized as a deficit for all districts. Sukajaya District needs 4 public high school buildings but only 1 unit is available, Sukakarya District needs 3 high school buildings but only 1 unit is available. The condition that needs more attention is the Sukamakmue district because it does not have a high school building while the need for a high school building in the district is 2 buildings. A recent study highlights that educational opportunities are particularly limited in rural areas, which face significant challenges such as inadequate school infrastructure and resources. For instance, it can be challenging for many rural areas to meet the needs of their citizens in terms of education. There aren't many high schools in some places, which makes it harder for pupils to get the resources they need for their education (Drescher & Torrance, 2022).

Overall, there are not enough public senior high school buildings in each district at Sabang Municipality. This condition shows that senior high school facilities, which ideally are district level service facilities, do not seem to be well distributed at Sabang Municipality. Sufficient infrastructure and facilities must be provided in order to support the application of learning, education can sustain a region in its transformation from underdevelopment to development. The education component has a direct bearing on regional growth at the macro level (Majumder, 2021).

Based on the analysis of the availability of public schools at the elementary, junior and senior high school levels at Sabang Municipality, it can be seen that the availability of buildings for the 3 levels of public schools cannot accommodate the needs of the population according to the population threshold which is a normative provision in the provision of urban service facilities. According to research by Sapakoly & Papiyaya (2023), features of educational services, such as all infrastructure and facilities created to satisfy educational needs, are crucial for assisting in the process of teaching and learning in the field. This suggests that the absence of educational service facilities can undoubtedly hinder the teaching and learning process. The discrepancy between the population that educational facilities must serve and the difficulties facing education demand special attention, as noted by Asmaradhana (2021), who stated that the availability of facilities is a factor in this problem that calls for significant efforts to rectify.

Affordability of Public Elementary, Junior High, and Senior High Schools at Sabang Municipality

The affordability of education facilities is based on the distance that is assumed to be tolerable to reach the service facilities. The distance that can be tolerated by the population is analysed based on the location of the school and the location of settlements in each district, resulting in school affordability data, which is described in detail as follows.

Affordability of Public Elementary School at Sabang Municipality

Based on the tolerable distance for elementary school facilities, the results of the analysis of the buffering of elementary school facilities to settlements in percentage units and categorized are presented in Table 5 and Figure 6.

Table 5. Affordability of Public Elementary Schools at Sabang Municipality

District Name	Settlement Area (Ha)	Area of Settlement Served (Ha)	Percentage (%)	Category
Sukajaya	325.29	250.47	77.00	High
Sukakarya	170.74	162.20	95.00	High
Sukamakmue	101.71	66.78	65.66	Medium

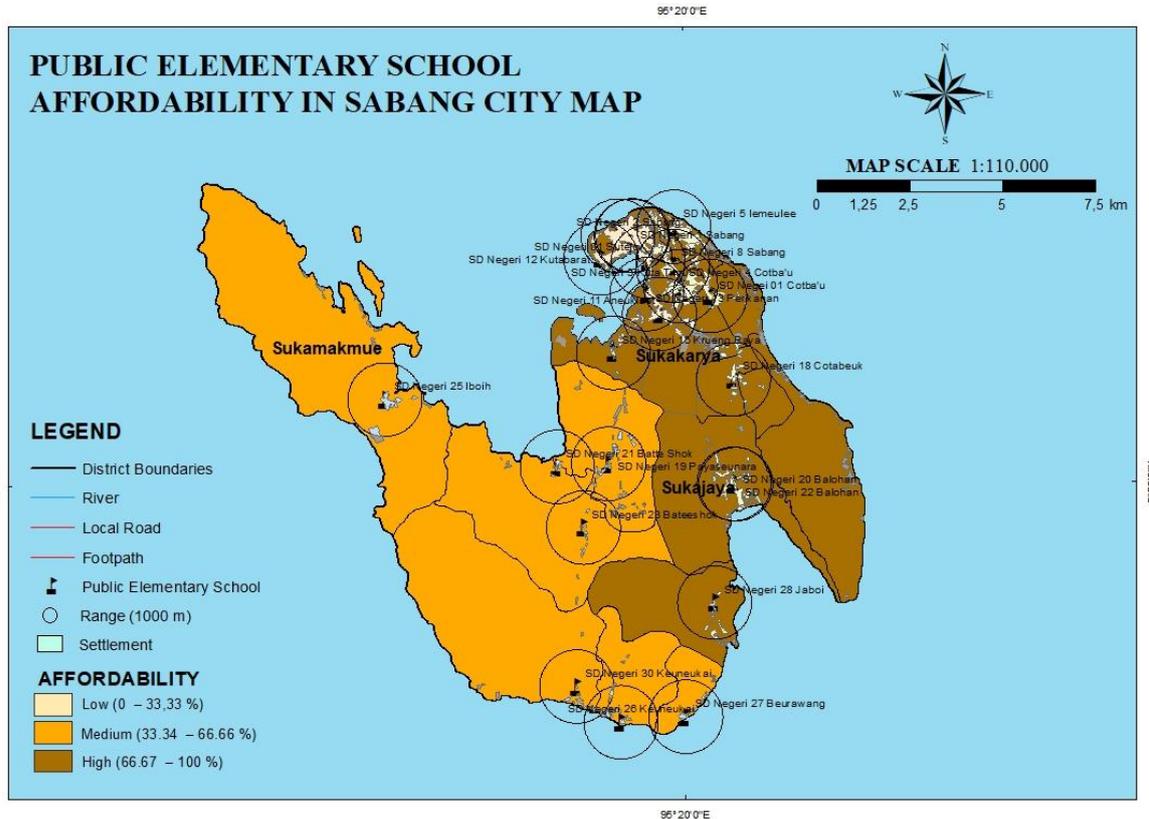


Figure 6. Affordability Map of Public Elementary Schools at Sabang Municipality

Based on Table 5 and Figure 6, it can be seen that the range of public elementary school buildings has reached locations in every district in Sabang Municipality. The affordability of elementary school buildings to settlement locations in each district is detailed, namely, Sukajaya district reached 77.00% categorized as high, Sukakarya Regency reached 95.00% categorized as high, and Sukamakmue Regency reached 65.66% categorized as medium. Based on this description, it can be concluded that for public elementary school building units in each district in Sabang Municipality, all of them have reached residential locations with high and medium categories.

This condition shows that elementary school facilities that are ideally located at the village level are quite good and evenly distributed in Sabang Municipality. The implication of well-distributed educational service facilities is the smooth learning process of the elementary school age population. According to Yao et al. (2022), investigating the accessibility of educational facilities aids in the reasonable planning of their layout and supports the balanced growth of education. Effective resource allocation has been a hot topic.

Affordability Public Junior High School at Sabang Municipality

Based on the tolerable distance for junior high school facilities, the results of the analysis of buffering junior high school facilities to settlements in percentage units and categorized are presented in Table 6 and Figure 7.

Table 6. Affordability of Public Junior High Schools at Sabang Municipality

District Name	Settlement Area (Ha)	Area of Settlement Served (Ha)	Percentage (%)	Category
Sukajaya	325.29	208.19	63.94	Medium
Sukakarya	170.74	64.88	38.00	Medium
Sukamakmue	101.71	57.09	56.13	Medium

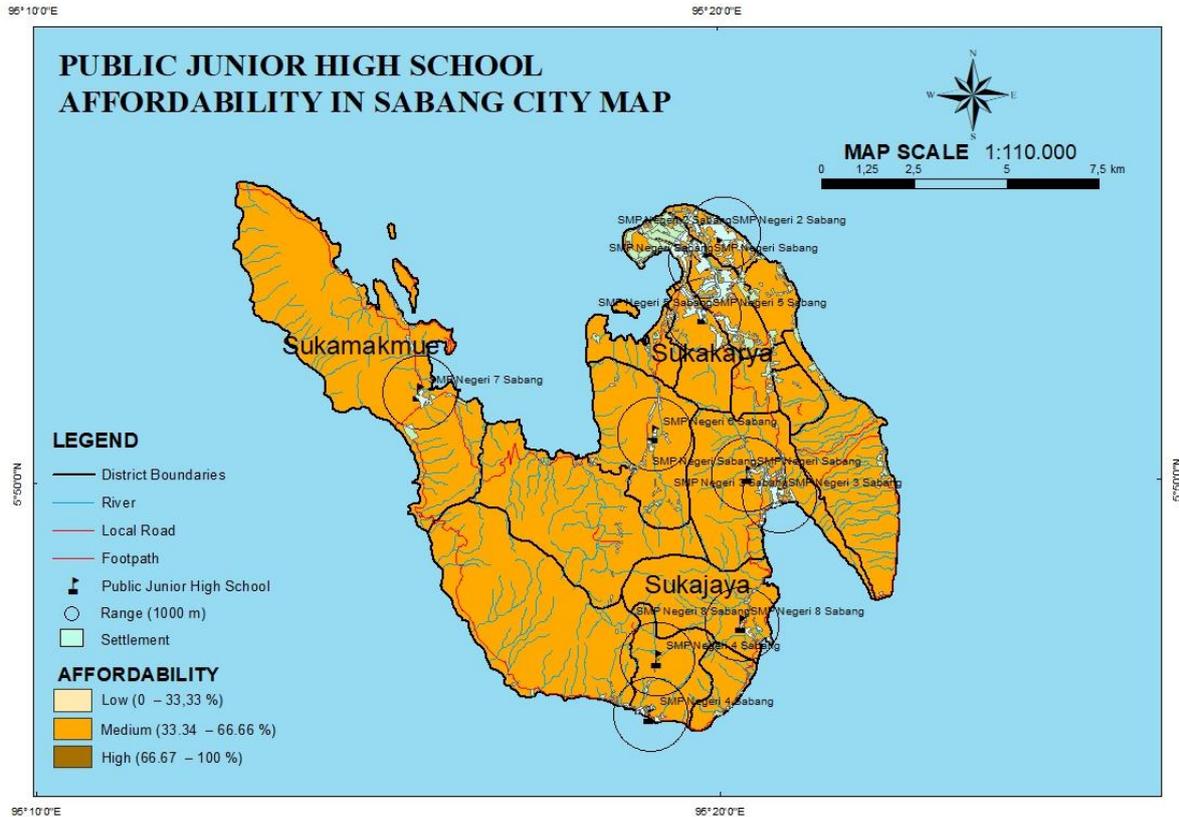


Figure 7. Affordability Map of Public Junior High Schools at Sabang Municipality

Based on Table 5 and Figure 6, it can be seen that most junior high school buildings have reached residential locations in each district at Sabang Municipality. The affordability of public junior high school buildings to residential locations in each district in detail, namely, Sukajaya district reached 63,94% categorized as medium, Sukakarya district reached 38,00% categorized as medium, and Sukamakmue district reached 56,13% categorized as medium. Based on this description, it can be known that for the public junior high school building units in each district in Sabang Municipality, most of them have reached residential locations with the medium category, but what needs special attention is Sukakarya district, because most of the settlements are not served. The inability of residents of a region to pursue their goals for themselves and their education can be greatly impacted by educational disadvantages in the area. For instance, children in underdeveloped or isolated rural areas with poor schooling are less likely to acquire an education of a calibre that will allow them to fulfil their potential (Xiang & Stillwell, 2023).

This condition shows that for junior high school facilities, which are service facilities at the district level, most of them based on their location can reach settlements in the medium category, and only Sukakarya district needs to be followed up by the government. School reachability must be felt by the entire community in order to support progress in education. This must receive attention from the Municipality government in order to make efforts in the form of equitable distribution of educational facilities throughout the Sabang Municipality area. Jiang et al. (2024) stated that fair primary education services are essential to the growth of society, as they raise people's standard of living and encourage superior, long-term regional development.

Affordability Public Senior High School at Sabang Municipality

Based on the tolerable distance for senior high school facilities, the results of the analysis of buffering senior high school facilities to settlements in percentage units and categorized are presented in Table 7 and Figure 8.

Table 7. Affordability of Public Senior High Schools at Sabang Municipality

District Name	Settlement Area (Ha)	Area of Settlement Served (Ha)	Percentage (%)	Category
Sukajaya	325.29	240.71	74.00	High
Sukakarya	170.74	169.03	99.00	High
Sukamakmue	101.71	0	0,00	Low

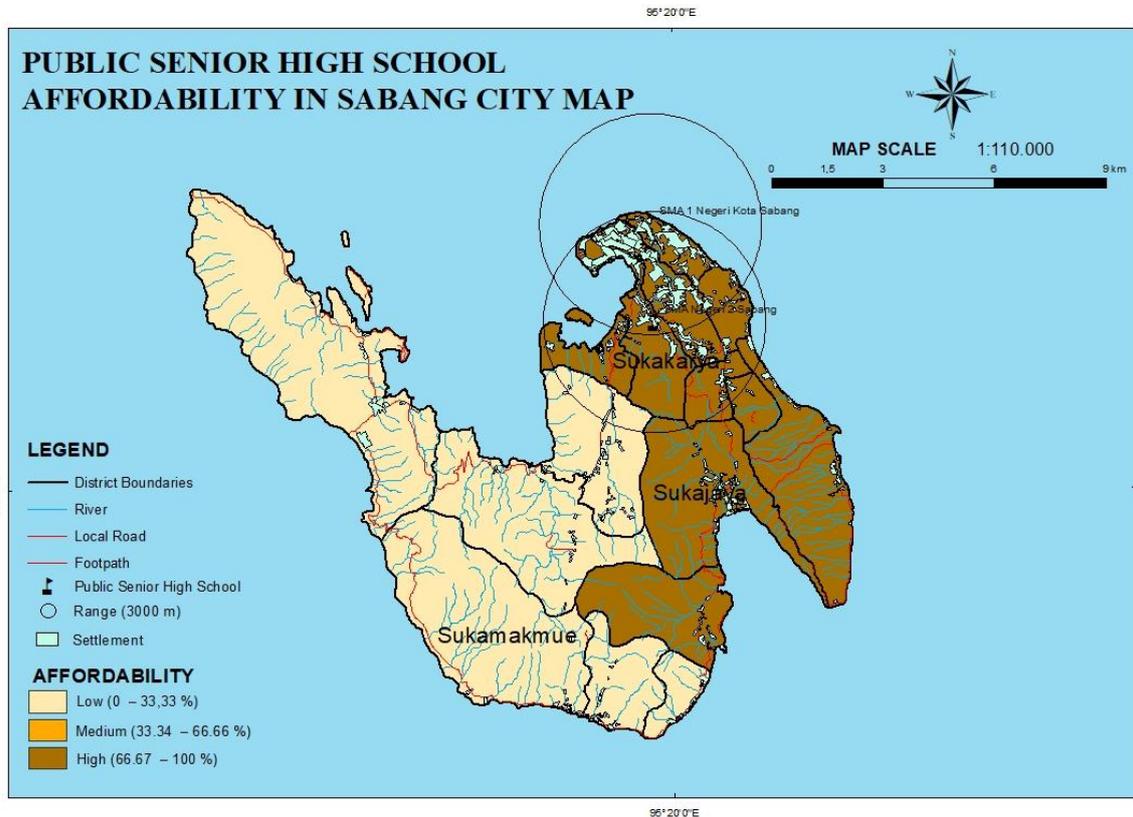


Figure 8. Affordability Map of Public Senior High School at Sabang Municipality

Based on Table 7 and Figure 8, it can be seen that most senior high school buildings have reached the location of settlements in each district at Sabang Municipality. The affordability of public high school buildings to residential locations in each district in detail, namely, Sukajaya District reached 74,00% categorized as high, Sukakarya District reached 99,00% categorized as high, and Sukamakmue District was 0%. Based on this description, it can be seen that for the public high school building units in each district at Sabang Municipality, most of them have reached residential locations with high categories. The population's ability to access the school is more influenced by its location than in other areas where there is a variety of private schools and alternative modes of transportation (De Armas et al, 2022). Only in Sukamakmue District did not reach at all because there was not a single public high school in the area. This lack of access is significant, because residing in underprivileged areas and substandard housing is linked to lower levels of educational preparedness.

This condition shows that for senior high school facilities, which are service facilities at the district level, most of them based on their location can reach settlements and only leaves one district that has not been accommodated due to the absence of senior high schools buildings. According to Kurniawan & Gunawan Putri, (2023), since schools are the primary means of supplying the community's need for education, they must be dispersed equally throughout the territory and positioned strategically.

Based on the results of the analysis of the affordability of public schools at the elementary, junior and senior high school education levels at Sabang Municipality, most of them can be reached based on the ideal distance between schools and settlements. Affordability can certainly not only be traced from distance but there are also other variables that are quite crucial, namely road networks, and modes of transportation. Evaluating physical access to schools relies on accessibility models. Han et al. (2023) stated that accessibility is the degree to which a service can be obtained from a certain place using a particular mode of transportation.

Evaluating the Availability and Affordability of Public Schools at Elementary, Junior and Senior High School Levels at Sabang Municipality

Based on the description of the analysis of school availability and affordability at Sabang Municipality as described in the previous section, to obtain comprehensive information in this study, it is also strengthened by the results of interviews with education *stakeholders* related to the availability and affordability of public schools, as follows.

Availability of Public Elementary, Junior High, and Senior High Schools at Sabang Municipality

The following are the results of interviews with *stakeholders* at the Sabang Municipality Education Office whose information is quite representative related to availability, verbatim and interpretation as follows:

H who is the 1st informant and the Staff for Early Childhood Education and Non-Formal Education Development, said, "...for public schools in Sabang, there are 2 unit of high schools, then 8 unit of junior high schools, and about 30 unit of elementary schools. Especially for elementary schools, every village already has one. So far, for school buildings, it is enough."

HP (2nd informant), Basic Education Development Staff, said, ".... the efforts made by the Sabang Municipality government to improve education equity are commendable. From elementary to high school, as far as I know, the educational infrastructure aligns with the national standard of education."

"The government always strives to complete all educational facilities in the city of Sabang," stated M (3rd informant) who work as the school supervisor at the junior high school level. "Every year, a report is reviewed to assess the condition of school infrastructure facilities. Currently, there are 8 public junior high schools, but there is still a shortage of public senior high schools, while each village is represented by an elementary school."

The Middle School Supervisor, identified as M (4th informant), said, ".....the government typically inspects our school, assessing the adequacy of facilities from elementary to high school levels. They also evaluate the feasibility of our infrastructure. The report is then submitted to the head of the Sabang city education office to ensure all necessary facilities are provided."

Based on the results of interviews with Sabang Municipality Education stakeholders related to school availability, it can be summarised that several stakeholders provided information that the availability of public schools is sufficient for elementary and junior high school levels, but is still considered insufficient for senior high school levels. Regarding the availability of elementary, junior and senior high school education facilities, the local government periodically evaluates both quantity and quality. Referring to the research conducted by (Pudyastuti et al., 2021), in order to provide fundamental services, the government must provide infrastructure and educational facilities. When sufficient and high-quality infrastructure and educational facilities are available, the rate of school attendance rises as well.

Affordability of Public Elementary, Junior High School and Senior High School at Sabang Municipality

The following are the results of interviews with stakeholders at the Sabang Municipality Education Office whose information is quite representative regarding affordability, verbatim and interpretation as follows:

H who is the 1st informant and the Staff for Early Childhood Education and Non-Formal Education Development, said, "To reach the facilities, it is good enough, children go to school

using public transportation prepared by the government, for building facilities, the point is that there are no obstacles - it is easy to reach, this Sabang is a small area, so it is very easy to reach."

HP (2nd informant), Basic Education Development Staff, said, "..... requires a needs analysis for transportation facilities to reach schools, of course the affordability of schools is intended to support learning activities."

The school supervisor at the junior high school level, M (3rd informant), said, "The supporting facilities are school bus transportation. The Sabang City Government provides buses for elementary, junior high, and high school students. For high school, for example, only in the city, so transportation is needed. The impact is that children can go to schools that are far from their homes."

The Middle School Supervisor, identified as M (4th informant), said, "..... if you go to public schools here, you can reach the children because there is a school bus, it is sufficient."

Based on the results of interviews with Sabang Municipality Education stakeholders related to school affordability, it can be concluded that several stakeholders provided information that there were no problems related to school affordability, because the Sabang Municipality Government had completed transportation facilities and infrastructure, especially the provision of school buses and public transportation, especially to reach high schools that were only in urban area. One informant also emphasised the need for a more detailed needs analysis related to the provision of transport to reach schools. Yue & Shan (2021) stated that in order to provide proper education, consideration must be given to accessibility, geographic obstacles, and settlement locations.

CONCLUSION

Based on the results and discussion described in the previous section, several important points can be concluded, namely: (1) the availability of public schools at the elementary, junior high, and high school levels obtained varying results at each level, but the essence can be taken that most of the public elementary, junior high, and high school facilities are categorized as deficit or insufficient (2) the affordability of public schools at the elementary, junior high, and high school levels obtained varying results, but the essence can be taken that most of the public elementary, junior high, and high school facilities can be reached by the population are categorized as high and medium, (3) the results of interviews with education stakeholders show that the availability and affordability of public schools at the elementary, junior high, and high school levels, is that most of the buildings are already available and do not have significant problems because of their location relatively close to settlements and equipped with supporting transportation facilities. The implications of some of the findings in this study can be used as a basis/reference by the government in evaluating the availability and affordability of education facilities. There are several things that have not been addressed in this study, resulting in some information that is not yet concrete, namely the availability and affordability of schools is only seen from schools with public status and school-age enrolment rates also need to be traced in order to research access and quality of education in an area.

ACKNOWLEDGMENTS

The authors would like to thank several parties, namely the Employees of the Sabang City Education Office, colleagues in Department of Geography Education, Universitas Negeri Medan, and several students who contributed to this research

DECLARATIONS

Conflict of Interest

We declare no conflict of interest, financial or otherwise.

Ethical Approval

The research has been approved by the Universitas Negeri Medan. All research was carried out in accordance with Universitas Negeri Medan research ethics guidelines applicable when human participants are involved.

Informed Consent

On behalf of all authors, the corresponding author states that all participants have been given informed consent and agreed to take part in this study.

DATA AVAILABILITY

Data used to support the findings of this study are available from the corresponding author upon request.

REFERENCES

- Ashik, F. R., Mim, S. A., & Neema, M. N. (2020). Towards vertical spatial equity of urban facilities: An integration of spatial and aspatial accessibility. *Journal of Urban Management*, 9(1), 77–92. <https://doi.org/10.1016/j.jum.2019.11.004>
- Asmaradhana, E. T. (2021). Evaluasi Daya Layan Fasilitas Pendidikan di Kota Blitar. *Geodika: Jurnal Kajian Ilmu Dan Pendidikan Geografi*, 5(1), 53–62. <https://doi.org/10.29408/geodika.v5i1.3197>
- Ayyumi, F. H., Damayanti, A., & Maulidina, K. (2022). Pola Sebaran dan Keterjangkauan SD, SMP, dan SMA di Kecamatan Tarogong Kidul, Kabupaten Garut: *Jurnal Kajian, Penelitian dan Pengembangan Pendidikan*, 10(2), 241–254. <https://doi.org/10.31764/geography.v10i2.10833>
- BPS (2023). Kota Sabang dalam Angka 2023. Retrieved from <https://sabangkota.bps.go.id/>
- Chen, C., Melville, B. W., Nandasena, N. A. K., Shamseldin, A. Y., & Wotherspoon, L. (2016). Experimental study of uplift loads due to tsunami bore impact on a wharf model. *Coastal Engineering*, 117, 126–137. <https://doi.org/10.1016/j.coastaleng.2016.08.001>
- Dawadi, S., Shrestha, S., & Giri, R. A. (2021). Mixed-Methods Research: A Discussion on its Types, Challenges, and Criticisms. *Journal of Practical Studies in Education*, 2(2), 25–36. <https://doi.org/10.46809/jpse.v2i2.20>
- Dawadi, S., Shrestha, S., & Giri, R. A. (2021). Mixed-methods research: A discussion on its types, challenges, and criticisms. *Journal of Practical Studies in Education*, 2(2), 25–36. <https://doi.org/10.46809/jpse.v2i2.20>
- De Armas, J., Ramalhinho, H., & Reynal-Querol, M. (2022). Improving the accessibility to public schools in urban areas of developing countries through a location model and an analytical framework. *Plos one*, 17(1). <https://doi.org/10.1371/journal.pone.0262520>
- Drescher, J. & Torrance, G., (2022). *What is The Status of Educational Opportunity in Rural America?*, Brookings Institution. United States of America. Retrieved from <https://coilink.org/20.500.12592/h8ncp0>
- Drescher, J., Podolsky, A., Reardon, S. F., & Torrance, G. (2022). The geography of rural educational opportunity. *RSF: The Russell Sage Foundation Journal of the Social Sciences*, 8(3), 123–149. <http://www.rsjournal.org/content/8/3/123>

- Giyarsih, S. R., & Amelia, E. S. (2023). The Role of the UMY Campus in Improving the Economic Welfare of Yogyakarta Suburban Residents. *Geosfera Indonesia*, 8(3), 347. <https://doi.org/10.19184/geosi.v8i3.43525>
- Government of Sabang City (2012). *Regulation Number 6 about Sabang City Spatial Planning Plan 2012-2032*. Retrieved from <https://jdih.sabangkota.go.id/>
- Gutierrez, E., & Terrones, F. (2023). *Small and Sparse: Defining Rural School Districts for K-12 Funding*. Research Report. Urban Institute. Retrieved from <https://eric.ed.gov/?id=ED629039>
- Han, Z., Cui, C., Kong, Y., Li, Q., Chen, Y., & Chen, X. (2023). Improving educational equity by maximizing service coverage in rural Changyuan, China: An evaluation-optimization-validation framework based on spatial accessibility to schools. *Applied Geography*, 152. <https://doi.org/10.1016/j.apgeog.2023.102891>
- He, G., & Huang, Q. (2021). Geospatial Analysis and Research on Social and Spatial Inequality of Compulsory Education: A Case Study of Hangzhou, China. *Complexity*. <https://doi.org/10.1155/2021/6265751>
- Ibnu, M., Saputra, I. A., Maliki, R. Z., Budianta, A., & Ali, Z. (2023). Carrying Capacity of Education Facilities in Banawa Sub-District, Central Sulawesi Province. *Tunas Geografi*, 12(2). <https://doi.org/10.24114/tgeo.v12i2.50934>
- Jamil, Z. A., Huda, I. A., & Kurniawan, B. (2021). Educational Facilities Needs Management Based On Population Growth Projections Jambi Province Of 2023. *Tunas Geografi*, 10(1). <https://10.0.94.50/tgeo.v10i1.27197>
- Jażdżewska, I. A., Lechowski, Ł., & Babuca, D. (2022). GIS-Based Approach for the Analysis of Geographical Education Paths. *ISPRS International Journal of Geo-Information*, 11(1). <https://doi.org/10.3390/ijgi11010041>
- Jiang, J., Wang, Z., Yong, Z., He, J., Yang, Y., & Zhang, Y. (2024). Spatial Distribution and Accessibility Analysis of Primary School Facilities in Mega Cities: A Case Study of Chengdu. *Sustainability (Switzerland)*, 16(2). <https://doi.org/10.3390/su16020723>
- Kurniawan, M., & Gunawan Putri, I. M. (2023). Analisis Keterjangkauan Dan Pola Sebaran SMA/SMK/MA Negeri di Kabupaten Tangerang Menggunakan Nearest Neighbor Analysis. *Jurnal Analisa Pemikiran Insaan Cendikia*, 6(1), 74–85. <https://doi.org/10.54583/apic.vol6.no1.115>
- Majumder, S. (2021). Spatial Pattern of Multi-dimensional Regional Disparities in the Level of Socio-economic Development in West Bengal: A Geographical Analysis. *Geosfera Indonesia*, 6(3), 260. <https://doi.org/10.19184/geosi.v6i3.25728>
- Megawati, I., & Kurniawan, M. (2023). Analisis Keterjangkauan Dan Pola Sebaran Sma/Smk/Ma Negeri Di Kabupaten Tangerang Menggunakan Nearest Neighbor Analysis. *Jurnal Analisa Pemikiran Insaan Cendikia*, 6(1), 74–85. <https://doi.org/10.54583/apic.vol6.no1.115>
- Ministry of Education and Culture, Indonesia (2007). *Regulation of the Minister of Education and Culture about Standards of Facilities and Infrastructure for Schools*. Ministry of Education and Culture.

- Muhaimin, A. A., Gamal, A., Setianto, M. A. S., & Larasati, W. L. (2022). The spatial justice of school distribution in Jakarta. *Heliyon*, 8(11). <https://doi.org/10.1016/j.heliyon.2022.e11369>
- Mustar, A. R., Sobri, K. M., & Sriati, S. (2022). Segmentation of Village Accessibility of Education Service Facilities in Ogan Komering Ulu Selatan Regency. *JKAP (Jurnal Kebijakan dan Administrasi Publik)*, 26(2), 102–114. <https://journal.ugm.ac.id/jkap/article/view/60773>
- Muta'ali, L. (2015). *Teknik Analisis Regional Untuk Perencanaan Wilayah, Tata Ruang dan Lingkungan*. Yogyakarta: Badan Penerbit Fakultas Geografi.
- Nyimbili, F., & Nyimbili, L. (2024). Types of Purposive Sampling Techniques with Their Examples and Application in Qualitative Research Studies. *British Journal of Multidisciplinary and Advanced Studies*, 5(1), 90–99. <https://doi.org/10.37745/bjmas.2022.0419>
- Pranowo, K. D., Situmorang, R., & Suharto, B. B. (2023). Analisis Ketersediaan dan Keterjangkauan Fasilitas Pendidikan di Kecamatan Sragen. *Reka Ruang*, 6(1), 14-21. <https://doi.org/10.33579/rkr.v6i1.3582>
- Pudyastuti, H., & Mulyaningsih, E. (2021). Pengaruh Ketersediaan Sarana Pendidikan Terhadap Angka Partisipasi Kasar (APK) di Kota Cilegon. *Equilibrium: Jurnal Pendidikan*, 9(1), 106–114. <https://doi.org/10.26618/equilibrium.v9i1.4424>
- Raharjo, S. S., & Hayati, R. (2022). Analisis Daya Layan dan Proyeksi Kebutuhan Fasilitas Sekolah Dasar di Kecamatan Colomadu Tahun 2030. *Geo-Image Journal*, 11(1), 7-13. <https://doi.org/10.15294/geoimage.v11i1>
- Rahmawati, E. (2024). Analisis Pola Persebaran dan Keterjangkauan SMA/SMK/MA di Kapanewon Piyungan Menggunakan Nearest Neighbor Analysis dan Buffering. *Jurnal Ilmiah Penalaran dan Penelitian Mahasiswa*, 8(1), 75-88.
- Razali, G., & Syamil, A. (2023). *Metodologi Penelitian Kuantitatif Kualitatif dan Kombinasi*. Bandung: CV. Media Sains Indonesia
- Rizal, S., & Syaibana, P. L. D. (2022). Analisis Keterjangkauan dan Pola Persebaran SMA/MA Negeri di Kabupaten Banyuwangi Menggunakan Analisis Buffering dan Nearest Neighbor pada Aplikasi Q-GIS. *Techno.com*, 21(2), 355–363. <https://doi.org/10.33633/tc.v21i2.5996>
- Sakti, A. D., Rahadianto, M. A. E., Pradhan, B., Muhammad, H. N., Andani, I. G. A., Sarli, P. W., Abdillah, M. R., Anggraini, T. S., Purnomo, A. D., Ridwana, R., Yulianto, F., Manessa, M. D. M., Fauziyyah, A. N., Yayusman, L. F., & Wikantika, K. (2022). School location analysis by integrating the accessibility, natural and biological hazards to support equal access to education. *ISPRS International Journal of Geo-Information*, 11(1). <https://doi.org/10.3390/ijgi11010012>
- Sapakoly, V., & Papilaya, F. (2023). Analisis Pola Persebaran dan Keterjangkauan SMA/SMK di Kota Salatiga Menggunakan Analisis Buffering & Nearest Neighbor. *Jurnal Sistem Informasi dan Informatika (Simika)*, 6(1), 1-9. <https://doi.org/10.47080/simika.v6i1.2189>
- Indonesia National Standart (2004). SNI 03-1733-2004 Tata Cara Perencanaan Lingkungan Perumahan di Perkotaan Retrieved from <https://www.nawasis.org/portal/>
- Sukwika, T. (2023). *Menentukan Populasi dan Sampling*. Metode Penelitian (Dasar Praktik dan Penerapan Berbasis ICT). 159-173

- Susilo, S., Budijanto, B., Deffinika, I., & Istiawati, N. F. (2022). Impact of Geographic Conditions on Sirri Marriage Phenomenon in Situbondo District. *Geosfera Indonesia*, 7(1), 85. <https://doi.org/10.19184/geosi.v7i1.28082>
- Taufiq, M., Manaf, M., & Alimuddin, I. (2023). Zonasi Sekolah Dalam Upaya Pemerataan Akses Pendidikan: Analisis Keruangan Pada Sebaran Sekolah Menengah Atas di Kota Parepare. *Urban and Regional Studies Journal*, 6(1), 94–107. <https://doi.org/10.35965/ursj.v6i1.3810>
- Wang, Y., Liu, Y., Xing, L., & Zhang, Z. (2021). An improved accessibility-based model to evaluate educational equity: A case study in the city of wuhan. *ISPRS International Journal of Geo-Information*, 10(7). <https://doi.org/10.3390/ijgi10070458>
- Xiang, L., Stillwell, J. (2023) Rural–Urban Educational Inequalities and Their Spatial Variations in China. *Applied Spatial Analysis and Policy*, 16, 873–896. <https://doi.org/10.1007/s12061-023-09506-1>
- Yao, L., Lv, M., Li, T., Wang, D., & Cao, X. (2022). Exploring the Evolution of the Accessibility of Educational Facilities and Its Influencing Factors in Mountainous Areas: A Case Study of the Rocky Desertification Area in Yunnan, Guangxi, and Guizhou. *ISPRS International Journal of Geo-Information*, 11(5). <https://doi.org/10.3390/ijgi11050296>
- Yue, M., & Shan, S. (2021). Evaluation and Optimization of Urban Basic Education Facilities Layout based on GIS A Case Study in Xuzhou, China. *E3S Web of Conferences*, 290. <https://doi.org/10.1051/e3sconf/202129002002>
- Zhu Y, Zinda JA, Liu Q, Wang Y, Fu B, Li M. (2024). Accessibility of Primary Schools in Rural Areas and the Impact of Topography: A Case Study in Nanjiang County, China. *Land*. 12(6):1134. <https://doi.org/10.3390/land12061134>