

Carrying Capacity of Education Facilities in Banawa Sub-District, Central Sulawesi Province

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Abstract

Education is a basic human need with the aim of achieving high productivity. The results of field surveys in Banawa Regency show that the availability of educational facilities to meet educational needs, based on population projections in 2044, has yet to reach the optimal level. Therefore, careful planning is needed in improving and placing educational facilities. This research aims to evaluate the availability of educational facilities according to the population's needs by analyzing the carrying capacity of facilities based on public service standards regulated in SNI 03-1733-2004 concerning urban area planning. The methodology used involves analysis of the carrying capacity of facilities to determine the population's need for educational facilities, population projections using geometric formulas to calculate the expected number of residents in the projected year, as well as spatial analysis using Geographic Information System (GIS) software to assess the distribution of facilities education in Banawa District. The findings from this research indicate that currently, there are 82 units of educational facilities in Banawa District, consisting of 39 PAUD units, 31 elementary school units, 8 junior high school units, and 4 high school units. However, additional educational facilities are needed for 7 PAUD units, 5 elementary school units, 4 junior high school units, and 8 high school units in Banawa District.

Keywords: Education, Facilities, Carrying Capacity, Banawa

INTRODUCTION

Education is one of the most important aspects of the development of society. Moreover, plays a role in improving the quality of life. Education is important because it is the basis for developing constructive and creative thinking patterns. Through adequate education, a person will be able to develop optimally both economically and socially. Education can be viewed broadly, technically, or in terms of Field results and processes (Umasangadji, 2015).

The quality of education is one of the outcomes of the Sustainable Development Goals (SDGs) declared in 2015 by the United Nations. SDGs, which stands for Sustainable Development Goals, is a plan of action for the 2030 agenda on sustainable development encompassing People, Planet, and Prosperity and strengthening universal peace. The need for service facilities influences the quality of education. These

service facilities serve the purpose of accommodating the increasing population and the dynamics of the population's socio-economic development. The increasing population will result in the improvement of these facilities (Munir, 2014).

The 1945 Constitution mandates the government to seek and organize a national education system that can improve faith and piety to God Almighty and noble character to educate the nation's life. So, according to Law Number 20 of 2003 concerning the national education system, every Indonesian citizen has the right to education. It clearly states that the government must be able to ensure the equitable distribution of educational opportunities to improve the quality, relevance, and efficiency of education management for the nation (Hakim, 2016).

Population growth and the rate of development of social activities carried out by the community will affect the area's

development, characterized by an increased need for both public and social facilities. This is coupled with the socioeconomic condition of the people who inhabit the area (the population), which depends on the availability of public and social facilities in the area (Dilahur, 2016). The needs of the population increase along with the increase in population. One of the most basic needs is the need for educational facilities (Rumengan et al., 2019).

Education facilities are one of the important means of infrastructure in regional planning. This is because education is one of the essential needs that must be fulfilled by every segment of society (Fidani & Prarikeslan, 2019).

Education facilities are one of the public facilities that should be considered by stakeholders in every region. Adequate or sufficient education facilities sometimes differ from the population in a certain area (Asmaradhana, 2021).

The adequacy of education facilities in a region is based on previously developed regional planning. The availability of education facilities depends on the indicators or standards used to measure them effectively. If the facilities are available and sufficient, the population can fulfill their living needs (Munawaroh et al., 2020).

Planning public facilities is extremely important, considering that changes in the conditions of an area require the existing public facilities to align with those changes, both in physical and social aspects. The planning of educational facilities should be based on the educational goals to be achieved, where these educational and learning facilities will provide learning spaces that enable students to develop knowledge, skills, and attitudes optimally (Sadali et al., 2018).

Public facilities, especially planned educational facilities, consider several indicators depending on the planning standards referenced in planning educational facilities. SNI 03-1733-2004 concerning procedures for planning residential environments in urban areas

prepared by the Ministry of Public Works, which regulates the minimum standards of public services for all facilities.

The availability of existing educational facilities for the entire population needs to be analyzed to determine their adequacy. This is then re-analyzed to determine the additional number of facilities by the projected population. Banawa district is one of the districts located in Donggala Regency, Central Sulawesi Province. It has a strategic location as a connecting hub between Palu City and Donggala Regency, and parts of Banawa District are situated along the Central Sulawesi-West Sulawesi Trans Road. This makes it an important area for transporting goods and the movement of people, both exiting and entering the two provinces.

Banawa District, being the capital of Donggala Regency and supported by its strategic location as mentioned above, this research aims to analyze the availability of existing educational facilities and the demand for educational facilities based on facility planning and the minimum service standards set in the existing facility planning standards.

RESEARCH METHODS

Based on the research objectives to be achieved, the research approach is quantitative and focuses on calculating numbers and analyzing them based on existing data. The quantitative approach is used as a technical step to answer each research target. This type of descriptive research is a form of research designed to obtain information about the status of a symptom when the study was conducted (Purba, 2021).

Apart from using a quantitative approach in this research, to strengthen this research, an approach that is the basis for geographical knowledge, namely the spatial approach, was also used. Geography is a science that studies the similarities and differences of geosphere phenomena from a spatial and environmental perspective (Waluya, 2018).

The spatial approach studies geosphere phenomena by emphasizing the primary existence of space (Hardati, 2018). This is because Banawa District has a unique characteristic, namely a strategic position. After all, it is located along the trans-provincial road and is the center of government of Donggala Regency.

This research was conducted using a quantitative approach with two primary and secondary data sources. Primary data are obtained from direct observation of educational facilities, including Kindergartens, Elementary Schools, Junior High Schools, and High or Vocational Schools; for secondary data, among others, population data from 2017-2021, data on the status of government both villages and villages in Banawa District, and references in determining the planning of educational

facilities, namely SNI Number 03-1733-2004 concerning Procedures for planning residential environments in urban areas. The purpose of data collection, both primary and secondary, is to obtain data on the existing conditions of the study area, which will later be calculated. Furthermore, the stages will be carried out by the objectives of this study, namely identifying the number and distribution pattern of educational facilities.

The primary data collection method is carried out to seek information directly in the research area by conducting field observations. The data to be obtained in this survey is the existing condition of the distribution of educational facilities in the Banawa Sub-district. The primary data needs are described in the following table (Table 1).

Table 1. Primary Data Requirement

Number	Data requirements	Data source
1	Amount of Education Facilities	Field Observations
2	Coordinate Points of Education Facilities	Field observations

(Source: Data Result, 2023).

Meanwhile, the secondary data collection method is carried out to obtain data in the form of written documents that support the research process documents that support the research process. This survey is a preliminary study that briefly describes the

research area. The data needed are an overview of the research area, the distribution of educational facilities, and mapping data. The secondary data needs are described in the following table (Table 2).

Table 2. Secondary Data Requirements

No	Data requirements	Data source
1	Administrative map of Donggala Regency	RBI Map Donggala Regency
2	Shape file of Donggala Regency Toponymy	RBI Map Donggala Regency
3	Amount of Education Facilities	Central Bureau of Statistics Donggala Regency

(Source: Data Result, 2023).

Carrying capacity is the level of adequacy made to determine the extent of the fulfillment of public facilities (both physical and artificial) to the standard population (Zulkarnain et al., 2022). The

carrying capacity of educational facilities is calculated by comparing the availability of existing educational facilities with the need for educational facilities based on a predetermined threshold in area planning.

The threshold in question is the minimum service standard (SPM) regulated in SNI 03-1733-2004 concerning procedures for planning housing environments in urban areas. Indonesian National Standard (SNI) 03 1733 2004 is a regulation that regulates education in Indonesia. This SNI is essential in providing guidelines and references that educational institutions must adhere to when implementing a quality learning process. This document covers several aspects of education, some related to the availability of study rooms, classroom capacity, and supporting facilities and infrastructure. Through the implementation

of SNI 03 1733 2004, it is hoped that education in Indonesia can be standardized and improve its quality. This standard also aims to create a conducive learning environment, encourage innovation in education, and ensure that students receive education that meets their needs (Nugraha et al., 2004).

The quantitative approach used in this study is determining the carrying capacity of facilities (educational facilities) adjusted to the minimum Service Standards of facilities SNI 03-1733-2004 concerning urban area planning procedures (Table 3).

Table 3. Minimum Service Standards for Educational Facilities

No	Type of Facility	Number of Supporting	Needs per Unit of Facilities			Criteria
		Population (people)	Floor Area Min(M2)	Land Area Min (M2)	Achievement Radius(M)	Location
1	Kindergarten	1.250	216	500	500	In the middle of a grup people.Dont cross the highway.Join the park so that there is grouping of activities
2	Primary School	1.600	633	2.000	1.000	
3	Junior High School	4.800	2.282	9.000	1.000	Can be reached by public transportation
4	Senior High School	4.800	3.835	12.500	3.000	Attached the sport field.It dosen't always have to be in the center of neighborhood road.

(Source: SNI 03-1733-2003)

In determining the analysis of the carrying capacity of a facility, especially

educational facilities, it is to calculate the comparison of the availability of existing

educational facilities with the needs of educational facilities. With the following formula:

$$FCC = SI / DI$$

Information:

FCC: Facilities Carrying Capacity

Si: Supply of facilities

Di: Demand for Facilities

The results will be interpreted based on numerical calculations with parameters. If the results are equal to (=) 1, then there is a balance of service functions between the needs of the population and existing educational facilities, and they can be interpreted as efficient service levels. If the result is more than (>) 1 then educational facilities can meet the population's needs and can be interpreted as sufficient service levels. Finally, if the result (<)1, then it is stated that educational facilities are unable to support the needs of the population. There has been a shortage and requires the addition of education. Facilities causing this to be interpreted that the level of service of educational facilities could be more effective. The additional amount of educational facility needs can be calculated by subtracting the availability with educational facility needs, as the formula below:

Additional educational facility needs = Di-Si

Information:

Di: Demand for Facilities

Si: Supply of facilities

Then, in analyzing the carrying capacity of educational facilities in Kecamatan Banawa, it is summarized as follows:

1. All educational facilities in Kecamatan Banawa were analyzed using the Minimum Service Standard (MSS) indicators stipulated in SNI 03-1733-2004 on the procedures for planning

residential environments in urban areas and then regrouped according to the level of education.

2. Educational facilities that have been grouped in the table above are then calculated using carrying capacity analysis to determine the suitability between the availability of educational facilities and the population in each region to determine the need for educational facilities.
3. The results of the carrying capacity are then calculated again using additional facility analysis to find out the areas that need additional educational facilities or that are in accordance with the needs and availability of educational facilities in the region.

The second data analysis uses the Projected Needs of educational facilities. The primary purpose of the analysis is to ensure that all resources needed to complete such projects are available and accessible when needed (Ali, 2023), seen from the projected population in 2044. From this analysis, it will be known how the need for community services will affect the population in 2044. The following is the formula for projecting the needs of educational facilities:

$$Di-t(n) = JPt(n) / Thi$$

where, $JPt(n) = P0 (1+r)^t$

Information:

Di-t(n): The need for educational facilities in the nth year (Projection)

JPt(n): Population projected in the nth year

$P0 (1+r)^t$: Population projection by geometric growth method

This: Threshold of educational facilities

Based on this formula, it can be calculated the Additional Number of Education Facilities (NEF)

Services that must be fulfilled in the nth year, namely:

$$NEF = Dit(n) - Si$$

RESULTS AND DISCUSSION

Orientation and Administration of the Territory

This research was conducted in the Banawa subdistrict and was carried out from January-April 2023. The Banawa subdistrict geographically is directly bordered by the Pinembani subdistrict to the north, West Sulawesi Province to the south and west, and South Dolo subdistrict, Sigi Regency to the east. Banawa subdistrict has an area of 80.13 km². As with other regions in Indonesia, Banawa District also has two seasons: summer and rainy seas (Putra, 2022).

The livelihood of the people of Kecamatan Banawa, although it is a coastal area, is mainly that of farmers and laborers. The settlement pattern of the community fishermen in Kecamatan Banawa is built following the highway flow; the form of housing is very varied, ranging from permanent to semi-permanent and boarding houses board. The settlement area is located between the mountains and the sea

mountains and the sea. Besides being fishermen, Banawa people also farm in Fields (Zainuddin et al., 2020).

Banawa District is one of 16 sub-districts in Dongggala Regency. Astronomically, this sub-district is located at position 0°38'34"-0°49'33" South latitude and 119°48'24"-119°42'25"East.

Banawa subdistrict is divided into 5 villages and 9 Kelurahan. Kelurahan Ganti is the largest village (15.59 km²), while the village with the smallest with the smallest area is Kelurahan Tanjung Batu, with an area of 0.46 km². All villages or sub-districts in Kecamatan Banawa can be reached by vehicles, both four-wheeled and two-wheeled, to facilitate the transportation of goods and services. The village with the farthest distance from the capital center of Kecamatan Banawa is Loli Oge Village, which is 19 km away. Meanwhile, the village or sub-district closest to the capital center of Banawa subdistrict is Tanjung Baru Village, which has a distance of 0.5km.

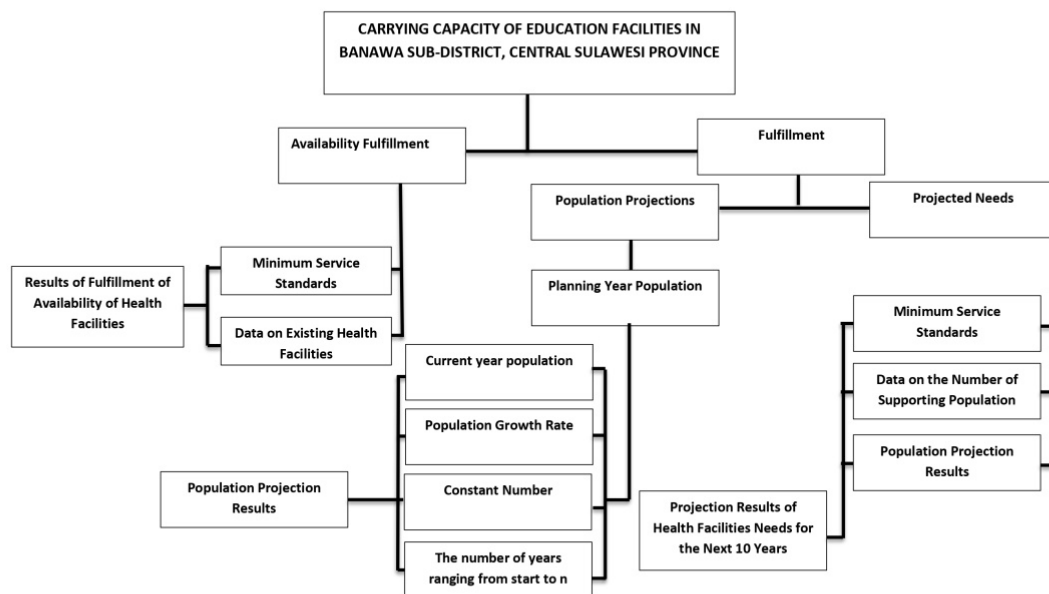


Figure 1. Research Framework

Banawa sub-district administratively consists of 14 neighborhoods or villages. Nine status areas are neighborhoods, and 5 status areas are villages (Figure 1). Banawa

sub-district consists of 14 villages or Neighborhoods whose village and government status can be seen in the following table (Table 2).

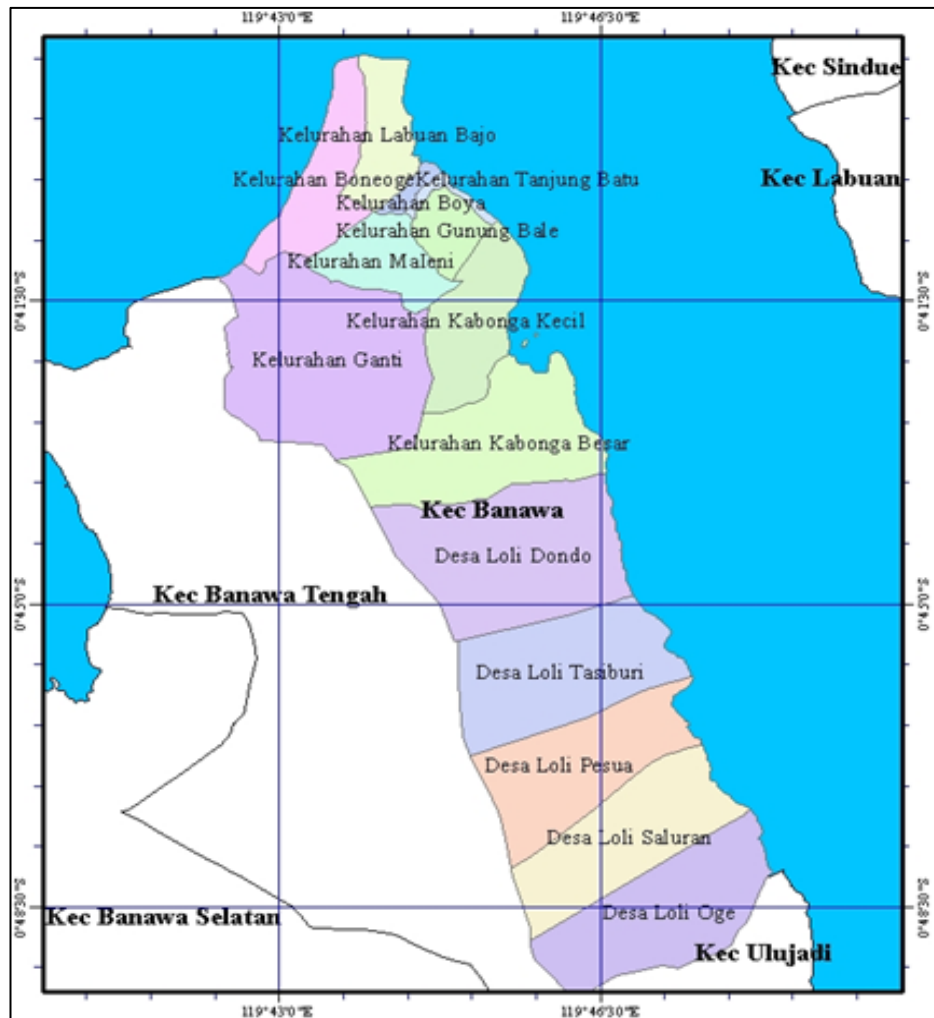


Figure 2. Map of Research Location

Table 4. Government Status/Classification of Neighborhood or Village in Kecamatan Banawa

No	Name Villages or Neighborhoods	Government Status	Classification
1	Loli Oge	Village	Definitive
2	Loli Tasiburi	Village	Definitive
3	Loli Saluran	Village	Definitive
4	Loli Pesua	Village	Definitive
5	Loli Dondo	Village	Definitive
6	Kabonga Besar	Neighborhood	Definitive
7	Kabonga Kecil	Neighborhood	Definitive
8	Tanjung Batu	Neighborhood	Definitive
9	Gunung Bale	Neighborhood	Definitive
10	Ganti	Neighborhood	Definitive
11	Maleni	Neighborhood	Definitive
12	Boya	Neighborhood	Definitive
13	Labuan Bajo	Neighborhood	Definitive
14	Bone Oge	Neighborhood	Definitive

(Source: Data Result, 2023).

Based on the research location map, Banawa District is dominated by lowland and coastal areas. Banawa District is the capital of Donggala Regency, Central Sulawesi Province. On the map above, it can be seen that the distribution of educational facilities follows public facilities, namely roads, and for villages or villages close to the center of government, educational facilities are adjacent or even side by side with these government facilities.

Population Identification and Projection

The terms "Population projection" and "Population forecasting" are often mistakenly accepted as the same term, even though they have fundamental differences. Projections are defined as future predictions based on rational assumptions and made using statistical or mathematical methods. (Supply et al., 2016). Population is defined as individuals, family members, community members, citizens, and the aggregate of quantities residing within the country's territorial

boundaries at a certain time (Nurmahdalena, 2016).

Population projection is a calculation method that aims to predict or forecast the population in the future based on past growth trends, also called the ratio value which is the amount of population increase within a certain period. With this prediction, we can determine how much the estimated addition of various facilities and utilities must be done (Janfa, 2021).

In this projection, the data are used derived from the population and the average growth rate of each sub-district. The data is then used as a basis in determine population projections for the next 10 years. The method used to calculate population projections is Multiple Interest analysis (Exponential) with a specific formula (Ardhani et al., 2021).

In the last five years released by the Central Bureau of Statistics of Donggala Regency in the publication of Banawa Subdistrict figures, it can be seen that the population of Banawa Subdistrict has experienced an increasing trend in population growth (Figure 3).

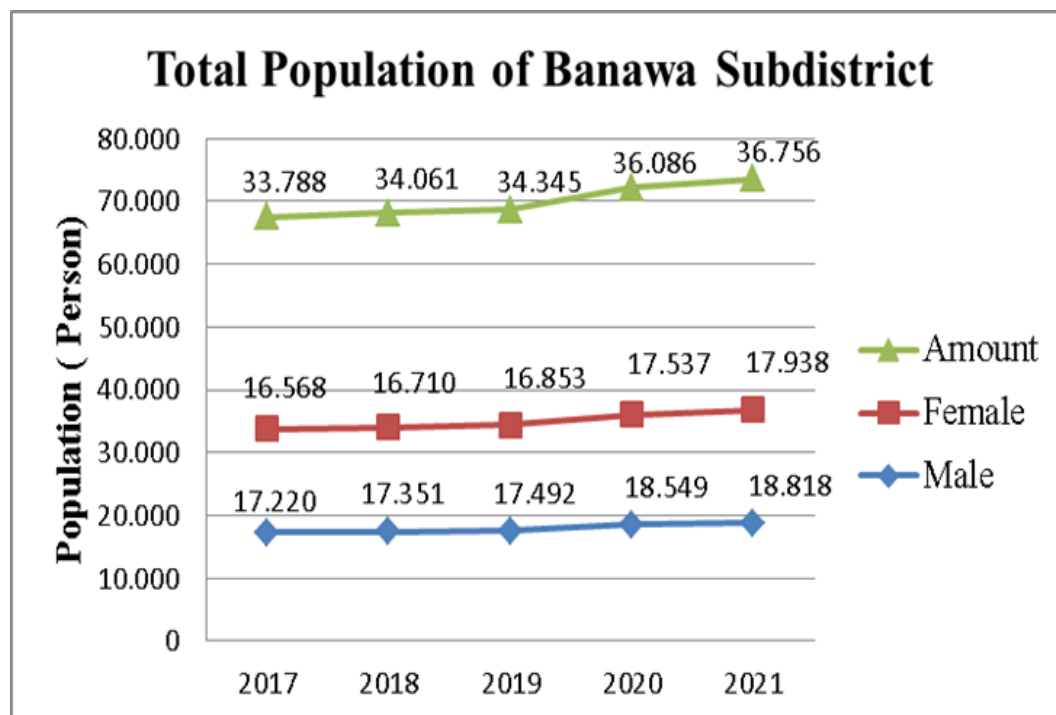


Figure 3. Population of Banawa Subdistrict
(Source: Donggala Regency Population and Civil Registry Office, 2023)

The population of Kecamatan Banawa is projected based on population data in each village or kelurahan. The population data will be used as a reference in projecting the population, sourced from

publication data from the Central Bureau of Statistics in Kecamatan Banawa Dalam Angka, which can be seen in the table display (Table 3).

Table 5. Population Projections for Banawa District

Neighborhoods/ Villages	Existing Population			Projected Population		Results	
	2017	2021	2024	2029	2034	2039	2044
Loli Oge	1.800	1.986	2.107	2.326	2.569	2.836	3.131
Loli Tasiburi	1.909	2.117	2.313	2.681	3.108	3.604	4.178
Loli Saluran	989	1,195	1,383	1,765	2,253	2,875	3,670
Loli Pesua	1,456	1,767	2045	2,610	3,331	4,252	5,427
Loli Dondo	1,345	1,556	1,750	2,129	2,590	3,152	3,835
Big Kabonga	2,769	2,989	3,171	3,502	3,866	4,269	4,713
Little Kabonga	2,866	3,187	3,482	4,037	4,680	5,425	6,289
Tanjung Batu	2,694	2,532	2,608	2,741	2,881	3,028	3,183
Mount Bale	2,428	2,766	3,022	3,503	4,061	4,708	5,458
Change	4,019	4,579	5,003	5,800	6,724	7,795	9,037
Little ones	2,646	2,730	2,812	2,956	3,106	3,265	3,432
Boy	2,991	2,852	2,938	3,088	3,245	3,411	3,585
Labuan Bajo	2,630	2,911	3,089	3,410	3,765	4,157	4,590
Good Oge	3,246	3,589	3,809	4,205	4,624	5,125	5,659
Banawa District	33,788	36,756	39,005	43,065	47,547	52,496	57,960

(Source: Researcher Analysis Results, 2023)

Based on the geometric calculation table above, it shows that in 2024-2044 successively the kelurahan or village with the smallest population and the largest is for the kelurahan or village with the smallest population is Loli Saluran Village which in 2024 is 1.383 people, in 2029 is 1.765 people, in 2034 is 2.235 people, in 2039 is 2.875 people, in 2044 is 3.670 people. Meanwhile, for the kelurahan or village with the largest population, the kelurahan Ganti in 2024 alone had a population of 5,003 people, followed by 5,800 people in 2029, 6,724 people in 2034, and 9,037 people in 2044.

Educational Facilities

Educational facilities are one of the resources that support the learning process in schools (Ardhani et al., 2021). The success of an educational program is

highly dependent on the condition of educational facilities in the school. To find out the need for educational facilities in a work unit, information is needed about educational facilities and infrastructure, both facilities and infrastructure that exist in the field and which should be by applicable regulations (Amanda, 2020).

Analysis of the needs for facilities and infrastructure, such as educational and learning facilities, will be closely related to several aspects, namely: 1) the population and the results of its projections, 2) the standard minimum number of requirements for the facilities in question, and 3) the standard space requirements for each facility/infrastructure field (Jamil et al., 2023).

Educational facilities themselves are divided into two, namely educational facilities and infrastructure. Educational

facilities are directly related to teaching and learning activities in schools, namely classrooms, blackboards, and educators. Educational infrastructure is an educational facility not directly related to school teaching and learning activities, such as school yards, school buildings, and worship rooms (Bancin, 2017).

Analysis of educational facilities is an activity that compares data in the field with data that should exist according to the determination of educational facilities and

infrastructure. The analysis results rely on two pieces of information, namely information about conformity and no conformity (Fauzi, 2021).

Based on a field survey of educational facilities in the Banawa sub-district, it is known that the number of educational facilities in the Banawa sub-district is 82 units. The classification of the health facilities in question can be seen in the table (Table 6).

Table 6. Total education facilities in Banawa Subdistric

No	Type of Education Facilities	Total
1	Preschool or Kindergarten	39
2	Primary School	31
3	Junior High School	8
4	Senior High School	4
Total		82

Source: Researcher Analysis Results 2023

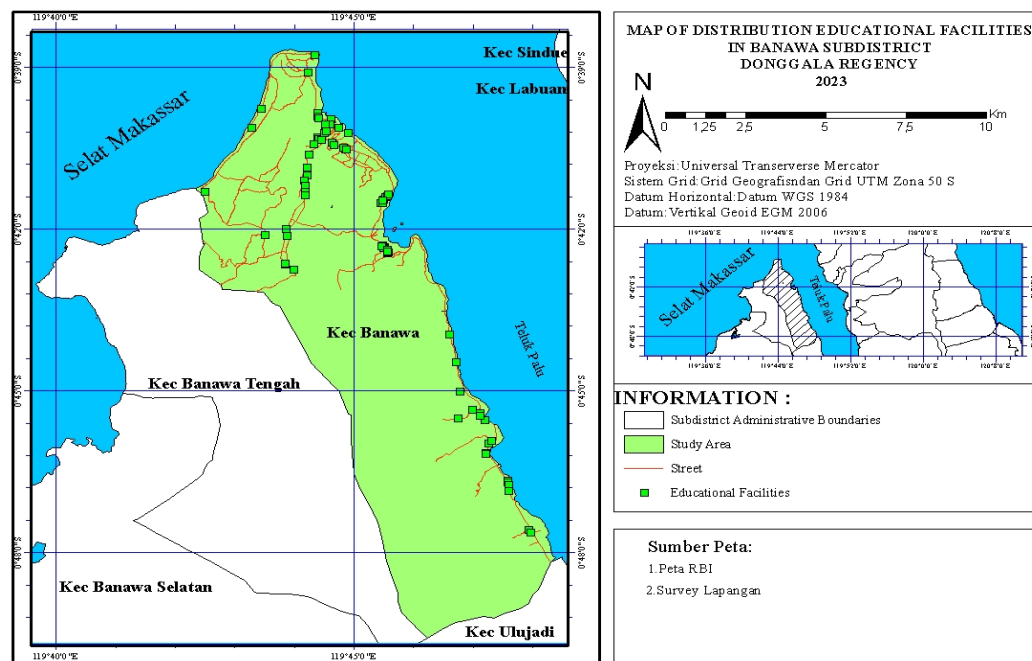


Figure 4. Map of Distribution pf Educational Facilities

Analysis of Projected Demand and Facility Carrying Capacity for education Facilities

The development of a city is closely related to the population factor. The rate of population growth will affect the development of a city. So when the population increases, there will be several

things that will be affected as a consequence of the increase in population. One form of consequence of the population is the increasing need for facilities and infrastructure, one of which is educational facilities that can be physically seen is educational facilities. So it is necessary to

project educational facilities with their suitability for the projected population (Baroroh, 2018).

Facility needs projection analysis is a process for estimating or projecting the need for facilities or facilities to complete a particular project or task. The main goal of

this analysis is to ensure that all the resources needed to complete the project are available and accessible when needed in the field (Putra, 2017). The following is the projected need for education facilities in the Banawa sub-district (Table 5).

Table 6. Projected Need for Educational Facilities in Banawa District

Sub-district	Preschool or Kindergarten	Total Eks	Demand (Unit)	Additional facilities
	Total Population			
Banawa	57.960	39	46	7

Sub-district	Junior High School	Total Eks	Demand (Unit)	Additional facilities
	Total Population			
Banawa	57.960	8	12	4

(Source: Researcher Analysis Results, 2023)

CONCLUSION

Banawa District is one of the sub-districts in Donggala Regency. Based on its topography, Banawa District is dominated by coastal areas and some highlands near the sub-district capital. Banawa District has an area of 80.13 km² with a village or sub-district level administrative area of 14 villages. All of which have definitive status. Based on the map of the distribution of educational facilities in Banawa District, the availability and placement of educational facilities in Banawa District is not yet optimal, in addition to the need for additional educational facilities based on population projections in 2044, which require additional educational facilities as well as future placement of facilities. Education is adjusted to affordability because existing, exceptionally high school-type educational facilities, are more concentrated in sub-district capitals. This certainly makes it difficult for people in rural areas to reach educational facilities, most of which are in sub-district capitals. Based on a field survey conducted in January-April 2023, the number

of educational facilities in Banawa District was 82 units.

After the data obtained from the field survey was then analyzed, the addition of existing educational facilities in Banawa District as a result of the projected population in 2044 included the type of pre-school education, which includes early childhood education and kindergartens, is necessary to add 7 units, schools Elementary schools need to add 5 units of facilities, junior high schools need to add 4 units, and for high schools need to add 8 units of facilities.

The suggestions from the results of this research can become study material and a basis for the Donggala Regency Government in planning and developing educational facilities. It can be used as a reference source for academics and researchers, especially for those interested in research on facility planning in a country.

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