

**PLANNING OF SECONDARY SCHOOL LOCATION AT  
SUB-CENTRE OF MEDAN SELAYANG SERVICE BASED  
ON GEOGRAPHIC INFORMATION SYSTEM**

**Mansyur Hidayat Pasaribu**

email: [mansyurpasaribu@gmail.com](mailto:mansyurpasaribu@gmail.com)

State University of Medan, North Sumatra-Indonesia

***Abstract,** This research aimed to solve the problem of requirement of facility and infrastructure of high school education year 2030 at 4 sub-districts in sub department of Medan Selayang. By knowing the number of junior high school student we can calculate requirement of middle school infrastructure needed. The need for secondary school building infrastructure at the Medan Selayang service sub-center in 2030 is calculated based on the number of population aged 0-4 years in 2016 as users of secondary education services in the planning year. The need for the number of new school units based on the maximum capacity of study groups available in each school in the study area, the lack of learning groups is met through new classroom addition programs and the addition of new school units. With the population of middle school age in 2030 in four districts amounting to 33,299, it is required to provide 1 unit of new school in Medan Baru sub-district, 1 unit of new school in Medan Selayang sub-district, 2 units of new school in Medan Tuntungan sub-district. The lack of study group in Medan Baru sub-district can be fulfilled by adding new classroom based on the availability of school land. Planning of school location in the addition of new school unit based on spatial analysis using geographic information system application. Method of research used is descriptive method quantitatively. Quantitative analysis done By using Geographic Information System. Analysis is done based on the factors that influence the selection of school location which consists of service coverage factors, distribution pattern factors, accessibility factors and land use factors. From the results of analysis based on spatial data found showed that the area has not been served in the region Planning. This underserved area became a zone in the determination of secondary school location planning at the Medan Selayang service sub-center.*

**Key Words:** *Secondary School Needs, Geographic Information System, Location Planning.*

## **INTRODUCTION**

Education is the learning of knowledge, skills, and habits of people who are passed from one generation to the next through teaching, training, or research. Education often takes place under the guidance of others, but also allows self-taught. Any experience that has a formative effect on the way people think, feel, or act can be considered educational. Education is generally divided into stages such as preschool, primary school, high school and then college, university or internship.

As stated in Article 33 of the 1945 Constitution stated that every citizen is entitled to receive instruction, then local government must provide educational

facilities and facilities that can meet the needs of the community. This fulfillment is inseparable from the accessibility of education and the provision of cheap educational facilities that are affordable by the community. The fulfillment of educational facilities can be managed by local governments in cooperation with private parties in an effort to accelerate the provision of educational facilities. However, the school development strategy and plan must be well planned so that the pattern of new school procurement can be controlled according to their needs. This cannot be separated from the role of local government in analyzing the needs of schools and distribution patterns of schools in accordance with population distribution and direction of regional development

According to Law No. 20 of 2003 on the National Education System that education is a conscious and planned effort to create an atmosphere of learning and learning process so that learners actively develop their potential to cultivate religious, self-control, personality, intelligence, noble character and skills needed Society, nation, and country. Local governments are also required to provide good education so that it can be used by the community in maintaining heritage and preserving the city environment.

In Government Regulation No. 17 of 2010 on Management and Implementation of Education mentioned that the level of education in Indonesia consists of Early Childhood Education, namely: Kindergarten, Basic Education, namely: Primary School, Secondary School, Secondary Education, namely: Secondary School Above, High School Vocational and Higher Education are: Polytechnic, Colleges, Universities.

In the distribution of concurrent governmental affairs between the central and provincial and district/ city governments as the implementation of Law 23 of 2014 on local government, it has been established that senior high school management is part of provincial government affairs. This includes the management of secondary education, special education management, the establishment of local secondary curriculum of secondary education and local content of special education, the transfer of educators and education personnel across districts and cities in 1 (one) province. Nationally, the central government manages higher education, as a regulator in the determination of national curriculum and management of mutations of educators and education staff across the province and provides accreditation of

universities, secondary education, primary education, early childhood education, and non-formal education. The existence of equal accessibility in education will make citizens have life skills that affect the ability to recognize the problems themselves and the environment that is expected to impact on the growth of its territory. Equity of education through the provision of educational facilities and infrastructure in accordance with the established standards is an important aspect in realizing educational equality and education quality. The availability of these facilities and infrastructure will increase the accessibility of education for the school-aged population.

In accordance with the *Strategic Planning* of the Ministry of Education and Culture 2014-2019, 12-year compulsory education program is planned to begin to be implemented in 2015. In this program is proclaimed that all Indonesian children must attend school and the government is obliged to finance and provide all the facilities. This program has been initiated from 2012 by the time of United Indonesia Cabinet. The 12-year compulsory education program implies that all children from ages 7 to 18 are required to attend primary and secondary education, to provide a better qualified generation. Improving access to secondary education through the introduction of a 12-year compulsory education to accelerate the availability of educated people in order to meet the needs of the labor market, by applying strategies to increase the availability of SMA / SMK in districts that do not yet have a secondary education unit, USB), the addition of new Classroom (RKB), and the construction of one-roof SMP-SMA; And the availability of SMKs that support the development of maritime, agriculture, tourism, manufacturing and creative economics;

High school in formal education Indonesia is known as High School (SMA) and Vocational High School (SMK), the Formal education in Indonesia students who continue to secondary education after completing primary education and graduate from junior high school or equivalent that is class 1 to grade 9. High school is taken within 3 years, ranging from class 10 to class 12. In 2013, according to BPS data, the number of Indonesians aged 15 years and over who worked 65.70% only had basic education background (SD / SMP), 24.51% of senior secondary education graduates (SMA / SMK) and 9.79 % Of graduates of higher education. The government has a

huge job considering the high demand for skilled and innovative labor to boost economic growth in Indonesia.

This indicates that the 12-year compulsory education program is not yet fully feasible. Provision of schools for each level must be provided by the government in accordance with the strategic plan that has been declared. In accordance with the standard of fulfillment of educational facilities, local governments are required to provide basic educational facilities in accordance with the needs of the population and the provision of secondary educational facilities at least one for each district. From the table it can be seen that in District of Medan *Polonia* and District of Medan *Perjuangan* do not have public school for junior high school. In middle level (SMA, SMK) there are 7 districts do not have public school. The fulfillment of medium-level facilities is carried out by the private sector by granting a school construction permit and an extension of the operational permit by the Medan Education Office.

Medan City consists of 21 sub districts and 151 villages, has an area of 26,510 hectares (265.10 km<sup>2</sup>) or 3.6% of the total area of North Sumatra. Compared to other cities / districts, Medan has a relatively small area with a relatively large population. Geographically Medan City is located at 3 ° 30' - 3 ° 43' North Latitude and 98 ° 35' - 98 ° 44' East Longitude. With the topography of Medan City tend to tilt to the north and located at an altitude of 2.5 - 37.5 meters above sea level. Administratively, Medan City is adjacent to Malacca Strait in the north, south, east, west and Deli Serdang regency in the west.

Based on data from the Central Bureau of Statistics 2015, the population of Medan City amounted to 2,210,624 inhabitants. Medan residents consist of 1,091,937 men and 1,118,687 women. Together with its metropolitan area (Binjai City and Deli Serdang Regency) the population of Medan City reached 4,144,583 inhabitants. Thus the city of Medan is the city with the largest population in Sumatra and the fourth in Indonesia. The majority of Medan City population is from the age group 0-19 and 20-39 years (41% and 37.8% of the total population respectively). Judging from the age structure of the population, Medan City occupied approximately 1.377.751 people of productive age, (15-59 years). Furthermore, seen from the level of education, the average length of school population has reached 10.5 years. Thus, there is relatively

sufficient labor available, which can work on many types of companies, whether services, trade, or manufacturing industries.

Geographically, Medan City has a strong spatial pattern relationship with the area of Binjai City and Deli Serdang district that surrounds it. The mobilization of residents from these two districts has a major impact on the influx of traffic, especially for education, employment, and trade movement.

The gross enrollment rate for elementary, junior and senior high school (SMK) is more than 100%, indicating that many students in Medan come from other regions outside Medan. This shows that the city of Medan until now still be one of the destination city in fulfilling the educational facilities for residents of districts / cities in North Sumatra Province in particular is the hinterland area around the city of Medan.

In accordance with Local Regulation of Medan City Number 13 Year 2011 on Spatial Planning of Medan City Year 2011-2031, it is explained that Medan City Service Center System Plan consists of City service center, Sub-center of city service and Center of environment. The City Service Center consists of 2 service centers in the city center and the city center in the north, town center in downtown Medan serving as a center for trade / business activities, service and activity centers for provincial and city governments, and economic service centers. The northern municipal service center serves as a regional center for regional trade and services, transportation service centers; Social-cultural activity centers, industrial centers and security defense centers. Sub-center service of Medan City consists of 8 service areas with different service development direction. The development of the sub-service center of Medan Selayang City located in the southern part of the city is directed as a trade and business center and an educational service center. The sub-district of Medan Selayang City consists of Medan Tuntungan sub-district, Medan Baru sub-district, Medan Selayang sub-district and Medan Johor district.

Implication of Spatial Structure Plan at RTRW Kota Medan 2011-2031 that it is necessary to make improvements in each service sub-center to be able to synergize with other service sub-centers so as to provide maximum services to the people of Medan City. In accordance with the development of service sub-center Medan Selayang as an education service center it is necessary to review the readiness of the region in the fulfillment of educational facilities. Specifically when

viewed from the completeness of medium-level educational facilities located in the District of Medan Selayang and Medan New District, until now not yet equipped with public schools provided by the local government to support this region as a sub-center of educational services. While there are some districts that have more than one middle school. There is still inadequate fulfillment of secondary education facilities provided by local governments.

The current development of information technology, especially in the field of information technology, data base, and satellite technology connected with the storage, analyzing, and presentation of data that is so complex in large numbers is expected an information system capable of assisting in decision making fast and precise. Geographic Information System (GIS) is one of the expected systems capable of assisting in decision making. Based on several definitions and notions of GIS, among them is an information system that can combine graphic data with object attribute data that is connected geographically on earth. GIS is a technology that is a very essential tool in storing, manipulating, analyzing, and recreating natural conditions with the help of attribute data and spatial data.<sup>1</sup> Another notion, namely: GIS is a section of information systems applied to geographic data or data base tools for analysis or mapping of something that is and occurs on earth<sup>2</sup>. Analogue maps, aerial photography, and satellite imagery are spatial data as mentioned above. Non-spatial data comes from statistical data, census data, field notes, and other tabular data. The main purpose of GIS utilization is to make it easier to get information that has been processed and stored as an attribute of a location or object. The ability of GIS as a modern information technology capable of providing spatial reference information is expected to analyze the distribution of secondary schools, thus greatly assisting in addressing spatial planning issues in education for the government. School distribution analysis using GIS is expected to make decisions about inefficient school closings, establish new schools, and provide other educational facilities, rayonisasi, and regrouping schools in the area of Medan City. The strategic role of GIS in educational planning makes researchers very interested in doing this research and contributing something useful for education in Medan City.

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<sup>1</sup> , Eddy Prahasta. 2004. *Sistem Informasi Geografis: Tutorial ArcView*. Bandung: Informatika.

<sup>2</sup> Supriadi dan Nasution, Zulkifli. 2007. *Sistem Informasi Geografis*. Medan: USU Press.

Based on the data mentioned above found that the existence of problems inequality of educational facilities in the city of Medan, which can lead to degradation of the quality of existing human resources. Management and Development City will be better if supported by the availability of reliable human resources. School is one of the containers to produce human resources needed in the future. Therefore it is necessary to do school planning, especially high school as an effort to provide facilities for the creation of educated human resources. This research specifically discusses the availability of medium-level educational facilities, namely Senior High School (SMA) and Vocational High School (SMK) and school planning based on the number of needs and the right location to ensure ease of access in continuing education

## **METHODOLOGY**

### **Kind of Research**

The approach method used is descriptive analysis method. Descriptive method because it gives a description or description of a situation clearly without any treatment of the object in the perusal.<sup>3</sup>

### **Data sources**

Data collection method that conducted in this research is survey and secondary data. Secondary data collection method consists of literature data obtained through literature study and obtain and collect data from various related agencies.

### **Technique of Data Analysis**

Stages of analysis conducted in this study are as follows:

1. Preparing data as an analysis material, through the incorporation of non spatial data items against spatial data.
2. Conducting a map digitization process used in the analysis of school distribution in accordance with that used in RTRW Kota Medan 2011-2030
3. Collect maps to be used as a base map to analyze the distribution of school locations. The basic map used is the administrative map of the sub-service area of Medan Selayang.

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<sup>3</sup> Ronny Kountur. (2007). Metode Penelitian untuk penulisan Skripsi dan Tesis, edisi revisi. Jakarta : penerbit PPM.

4. Conducting check plot, editing, and topology on land use map. After passing the check plot process, editing, and topology then produced a digital map of land use that is complete.
5. The process of check plots, editing, and topology is done with the help of Software Geographic Information Application system.
6. Conduct analysis based on 4 influencing factors ie service coverage, distribution pattern, accessibility, and land use.
7. Calculating school needs in the planning year 2030.
8. Overlay process in future school location planning between: regional administration map, land use map, school distribution map, population distribution map, and road network map.
9. Prepare a school location plan as a result of the current location conformity analysis with site conditions based on school needs in the planning year.

## **FINDINGS AND DISCUSSION**

### **Data Analysis**

The first analysis done in this research is non spatial analysis. This analysis aims to determine the availability of schools, current school capacity based on existing facility data and infrastructure, calculate school needs in the 2030 planning year in accordance with the school-aged population who will use the four sub-districts at the Sub-Service Center of Medan Selayang. The second analysis is to conduct spatial analysis based on existing spatial data of schools within the Sub-Territory of Medan Selayang. The data used in this study is secondary data from several sources, among others:

- a. Population data sourced from the Central Bureau of Statistics of North Sumatra Province
- b. General school data from Reference Data Ministry of Education and Culture of Indonesia
- c. The data of school facilities and infrastructure are sourced from Basic Data of Education Ministry of Education and Culture
- d. Data Map of Urban Spatial Planning Medan 2011-2031 is sourced from Bappeda Medan City

### **Number of Existing Schools**

## Planning Of Secondary School Location At Sub-Centre Of Medan Selayang Service Based On Geographic Informaton System

Based on the Basic Education Data of the Ministry of Education and Culture in the first semester year of 2015/2016, the number of public and private schools for elementary and junior high schools (SMA and SMK) in the planning area of Sub-Service Center Medan Selayang consisting of 4 Sub-districts (Medan Johor, Medan Tuntungan, Medan Selayang, Medan Baru) amounted to 129 units. All of these schools serve as a population distribution of schools within the study area.

### **Number of Junior High School**

The junior high school located at Medan Selayang Education Service Sub-Center consists of 66 schools consisting of 8 public schools and 58 private schools. The study group that is found in all junior high schools in the Sub-Center of Medan Selayang is 621 with total junior high school students totaling 19,524 people. Senior High Schools located at the Sub-District Education Services Medan Selayang amounted to 39 schools consisting of two public schools and 37 private schools

### **Population**

Medan City population aged 0-4 years based on data Central Bureau of Statistics amounted to 202,053 people spread over 21 districts. If it is observed in the planning area that is at the Sub-Service Center of Medan Selayang then the population of 0-4 years is 33,299 people from Medan Baru District, Medan Johor District, Medan Selayang Sub-District, Tuntungan Sub-district. This 0-4 year old population during the planning period of 2030 becomes a student who will continue in secondary school.

### **Analysis of New School Supply**

Based on the population number in the planning year of 2030, the number of residents in the four sub-districts is 96.6% of the present, then school growth should also be prepared from now on to meet the educational facilities and infrastructure needs of the residents to use.

### **School Needs Analysis**

School needs in accordance with the number of providers (supply) and demand (demand). Providers in question are high school (high school and

vocational school) and the need is a student of junior high school graduates. In the year of planning 2030 students of junior high school graduates who will continue their education at middle level is the population of 0-4 years old at the present time. The population of 0-4 years old is targeted at the Sub-Service Area of Medan Selayang consisting of residents from Medan Baru Sub-district, Medan Johor District, Medan Selayang Sub-District and Medan Tuntungan Sub-district. School needs based on the school-aged population during the planning year indicate that school deficiencies are found to be in accordance with the existing facilities and infrastructure currently owned by secondary schools. The calculation of classroom needs using SNI 03-1733-2004 standard on urban housing planning procedures.

The population that will continue their education to senior high school level in planning year 2030 amounted to 33,299 people. The maximum capacity of the classroom used by the school as a student learning group in accordance with Regulation of the Ministry of Education and Culture No. 22 years 2016 is 36 students for each group study. In accordance with this rule, the group of learners required to accommodate students at the secondary school level amounted to 924.97 (925) rooms. The current condition of room availability for student Group of Class scattered in four sub-districts amounted to 588 rooms, so that a shortage was found as many as 336.97 (337) rooms. The distribution of Group of Class shortage occurred in 4 sub-districts, namely 43 Group of Class in Medan Baru District, 109 Group of Class in Medan Johor District, 93 Group of Class in District of Medan Selayang, 90 Group of Class in District Medan Tuntungan. As per the standard of facilities and infrastructure has been established, for each high school maximum has 36 Group of Class per school and a maximum of 48 Group of Class per school for SMK. Thus, if 36 Group of Class per school are used, the scarcity of secondary schools spread across four sub-districts is 9.36 (10) schools.

In accordance with the Renstra of the Ministry of Education and Culture of the Republic of Indonesia, it is mandated that in order to increase the availability of SMA / SMK can be done through the construction of New School Unit (USB) and the construction of New Classroom (RKB).

The addition of new classrooms to schools that still have land makes the capacity to accommodate junior graduate students increased by 224 rooms. This addition maximizes the availability of Group of Class to 832 rooms. With the

addition of RKB in Medan Baru District is able to provide 28.83 classrooms to be used as the addition of new Group of Class. Despite the addition of new classrooms to maximize the needs of Group of Class in the 2030 planning year, there is still a lack of Group of Class of 92.97 (93 rooms).

#### **Analyzes Based on Reach Factors**

In this factor, what will be analyzed is the distance between the location of secondary school (SMA and SMK) with the location of junior high school (SMP). School locations and long distances add to the burden of transportation both for the city and for students using school facilities. It is expected that the nearest area can be found as an approach to junior high school students who will continue their studies to a higher level (SMA or SMK). Following the standard planning of educational needs of the Ministry of Public Works, it is mentioned that the distance of service distance as far as 3 km. Thus the coordinate data of high school and vocational schools is used as a starting point to calculate the range of services with 3 km distance parameters as the maximum range of services. Then overlay intersection (overlay intersection) to get the area out of reach in accordance with the parameters that are made. Areas that are beyond the reach of schools become the first overlapping map (overlay).

#### **Analyze Based on Distribution Pattern Factor**

In this factor, what will be analyzed is the pattern of high school spread (SMA and SMK existing) to the needs of secondary school supply (demand) in the planning year (SMA and SMK in 2030). The amount of existing secondary school capacity (existing) is based on the number of students per study group, the ratio of students per teacher. While the demand (demand) is viewed from the number of residents who will use secondary school that is the population at middle school age (16-18) years and the number of students graduate junior high school in the region in 2030.

The analysis of distribution patterns is tailored to the school needs analysis based on the data analysis of school needs in accordance with the current 0-4 year population that will use secondary school needs in the 2030 planning year.

#### **Analysis Based on the Factor of Accessibility**

In this factor, things that will be analyzed are the supporting facilities of the location of the school, namely the road facilities and infrastructure. Ease of

achievement to the planned school location. The parameters in this analysis are the collector path in the Medan Selayang Service Sub-Center.

The analysis undertaken at this stage is to overlap (clip tool) between the study area to the collector roadmap, using the maximum distance parameter of 1200 meters as the maximum range of roads against school access.

#### **Analysis Based on Conformity of Land Used Factor**

In this factor to be analyzed is the suitability of land that will be used as a school location reviewed using the applicable standards in accordance with the land use in accordance with the Regional Spatial Plan Medan Medan 2011-2031. The overlay intersection map of coverage factor, distribution pattern and accessibility will be reviewed according to land use by overlay intersection of low density zone (yellow zone) zone map which can be functioned as zone of facility provision public service.

#### **Planning New School Unit Locations**

School location planning is adjusted to the number of education service needs and map of overlay analysis on coverage factor, distribution pattern factor, accessibility factor and land use factor. The planned location of the New School Unit (USB) is recommended with a minimum land area of 12,500 m<sup>2</sup>, with a 3 km service radius, using collector road access in each district.

### **CONCLUSSION**

Educational planning should be done to provide a better education for future generations. The results of the analysis in this study indicate that:

1. Based on the data analysis of secondary school needs, in the year of planning 2030 sub-center of Medan Selayang service requires the provision of 925 study groups. The group of learners available at this time is 588 units. Meeting the needs of the number of study groups from the addition of new classrooms of 244 units, making available 832 units. The lack of 93 units of study groups is filled with the provision of New School Units (USB) referring to *Regulation of the Minister of Education and Culture*. 22 year 2016 About Standard Process of Primary and Secondary Education. Medan Baru sub-district requires 1 unit of secondary school, Medan Selayang Sub-district requires 1 unit of secondary school, and Medan Tuntungan sub-district requires 2 units of secondary school. Thus the

Subpopulation area of Medan Selayang requires the supply of 4 new school units with a total of 93 study groups.

2. Medan Johor Sub-district lacked 110 study groups in 2030, with the addition of new classrooms in schools that still have the availability of land capable of providing 364 study groups and this amount is still sufficient. The concept of fulfilling the need of medium education facilities and infrastructure in this District through the implementation of the program of providing new classrooms to schools that have the availability of land.
3. Based on the results of spatial analysis of coverage factors, distribution factors, accessibility factors, spatial pattern factors found that there are areas that have not reached the high school education facilities (SMA and SMK). Unnerved terrain on this factor becomes a recommendation for the location of providing new school units according to the number of needs in each district.
4. Based on the results of the analysis, it is found that the area that can be used as the location plan for the provision of New School Unit of SMA and SMK in the sub-service area of Medan Selayang.

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