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Analysis Of The Influence Of The School Safety Zone (Case Study on Jalan Ahmad Yani SDN 4 Guntung Manggis, Landasan Ulin District, Banjarbaru City)

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ABSTRACT

The School Safety Zone under review is the School Safety Zone on Ahmad Yani street in front of SDN 4 Guntung Manggis, Banjarbaru. The School Safety Zone itself can affect traffic conditions, ranging from volume, speed, and density. The purpose of this study was to determine the effect of the existence of a safe school zone and the absence of a safe school zone and to determine traffic performance on the Ahmad Yani road section which contained the school safety zone area. The research is a field survey to find data on volume, speed, and side resistance. The survey was taken under two conditions, namely the condition under the influence of the School Safety Zone and without the influence of the School Safety Zone. Model Analysis method Greenshield, the Greenberg Model, and the Underwood to determine the capacity on the road section which is supported by daily traffic volume data and vehicle speed to get the density on the road section. From the modeling analysis, the chosen model is the Greenshield model. From the calculation results, the maximum volume decreased by 13.14%, at the average speed decreased by 16.10%, and the maximum density increased by 3.52%. The ITP value is obtained with a V/C ratio at the operational hours of the School Safety Zone, in the area not affected by the School Safety Zone, the DS is 0.49 while in the affected area the School Safety Zone is DS 0.66. Both have an ITP C value which means Stable Flow, but the speed and motion of the vehicle is controlled, the driver is limited in choosing the speed.

Keywords: School Safety Zone, Speed Analysis, Greenshield, Road Performance

1. INTRODUCTION

The School Safety Zone (ZoSS) is an effort to control traffic activities by regulating speed in the form of placing road markings and traffic signs on-road sections in the area around the school environment. The goal itself is to prevent accidents and ensure the safety of children at school. Based on the 2018 regulation of the Director-General of Land Transportation, this is designed so that vehicles passing by it drive at a low speed (maximum 30 km / h) because schoolchildren themselves generally have a spongy nature and unpredictable movements so the hope is that the existence of ZoSS can provide anticipatory reaction time to road users. With the existence of school activities in the School Safety Zone area, there will be obstacles that will certainly affect the state of the

road section, this usually happens during the main hours of operation of the School Safety Zone. Because it has the potential to cause obstacles, therefore this study aims to analyze the influence and performance of roads in the School Safety Zone of SDN 4 Guntung Manggis, Banjarbaru.

2. LITERATURE REVIEW

Volume

The number of vehicles that go through the observation points set over a certain period is called volume. The unit for traffic volume that is often used in the study is to use the average daily traffic volume.

Speed

Speed is the level of movement within a certain distance in units expressed by km / h.

Density

Density is the number of vehicles occupying a length of road or lane. It is generally expressed in vehicles per kilometer (kend/km), vehicles per kilometer per lane (kend/km/lj), or smp/kilometer (Hendra and Purnawan).

Mathematical Relationship of Volume, Speed, and Traffic Density

Greenshields models

Linear relationships of velocity and density are the most commonly used relationships for reviewing traffic currents. Because the relationship is the simplest and also easy to implement. This model can be written as follows :

$$S = Sf - \frac{Sf}{Dj} . D \quad (1)$$

Where S is the speed (km/h), Sf is the speed of free current(km/h), D is the density(smp/km), and Dj is the density in conditions of total traffic jam (smp/km).

By substituting the equation above the relationship between volume and density is obtained as follows :

$$F = Sf. D - \frac{Sf}{Dj} . D^2 \quad (2)$$

The relationship between volume and speed based on the equation D = F / S is obtained as follows :

$$F = Dj.S - \frac{Dj}{Sf} . S^2 \quad (3)$$

To calculate the capacity used the following equation :

$$Fc = Dj \cdot \frac{Sf}{4} \quad (4)$$

Greenberg model

Logarithmic curves can express the mathematical relationship between density and velocity. The Greenberg model can be described as follows (McShane & Roes, 1990) :

$$S = Sc.\ln -\frac{Dj}{D} \quad (5)$$

Where Sc is the Speed at the time of maximum volume (km/h)

If the equation F = S.D, then the relationship between volume and density is as follows:

$$F = Sc.D.\ln \frac{Dj}{D} \quad (6)$$

Similarity of the relationship between volume and velocity :

$$F = S.Dj.\exp \frac{-S}{Sc} \quad (7)$$

Here's an equation for calculating capacity :

$$Fc = \frac{Dj.Sc}{e} \quad (8)$$

Here's an equation for calculating capacity

Underwood models

The Underwood model was deemed invalid for high-density results. Because the speed never reaches zero at a time when the density is high. With the following form of the equation (McShane & Roes, 1990) :

$$S = Sf.\exp \frac{-D}{Dc} \quad (9)$$

By substituting F = S.D to the equation above so that the relationship of the equation of volume and density is obtained as follows:

$$F = D.Sf.\exp \frac{-D}{Dc} \quad (10)$$

Similarly, by substituting the equation D = F / S to the first equation, so that the relationship of the equation of volume and speed is obtained as follows :

$$F = S.Dc.\ln \frac{Sf}{S} \quad (11)$$

The equation for calculating capacity is as follows :

$$Fc = \frac{Dc.Sf}{e} \quad (12)$$

3. METHOD

Data Collection Methods

The data taken in this study is limited to only one road section, namely the Banjarbaru-Banjarmasin direction road section. The data taken are as follows :

1. Volume Survey

Data collection is to record the number of vehicles passing by and vehicles recorded according to the predetermined group of vehicles.

2. Speed Taking Survey

Vehicle speed surveys use the instantaneous method by measuring moving travel.

3. Survey Geometric

The geometric survey data recorded were the shoulder of the road, the width of the road body, the road median, road equipment, and the length of the road.

4. Research Time

The survey was observed for one day on Wednesday, March 30, 2022. Data collection is carried out in an interval period per-10 minutes starting from 06.00 to 18.00 WITA.

Data Analysis Methods

The data observed from the field are data that are then used for the calculation of road section performance using the Greenshield model, the Greenberg model, and the Underwood model. With this method, it is useful to determine the capacity of vehicles and the performance of road sections which will later be compared to the results of the road sections before/without the influence of the School Safety Zone with the road sections the influence of the School Safety Zone area.

4. RESULT AND DISCUSSION

Road Conditions Before School Safe Zones

The results of the data from the model of the relationship equation between S-D and the correlation on the road section before the School Safety Zone can be seen as follows :

Table 1. Speed Model – Density and also Correlationf Before ZoSS Area

Relationship	Equation Model	Equation Model		r^2	R	X (smp/km)	Information
Greenshield	(-0,2986x)+52,231	x =	174,92	0,814	0,903	174,92	Very Strong
Greenberg	-10,59ln(x)+79,261	ln(x) =	7,48	0,825	0,908	1780	Very Strong
Underwood	53,626e-0,007x	$e^{-0,007x}$ =	53,62	0,824	0,908	1327,34	Very Strong

From the analysis, the most realistic density results were obtained from Greenshield modeling. So that the model of the similarity of the relationship between the characteristics of the traffic flow of each road section before the ZoSS area and the Greenshield selected model is as follows :

Table 2. Model of Similarities of Relationships Between Traffic Flow Characteristics Before ZoSS Areas

Type	Relationship	Equation
Greenshield	S - D	S = (52,231- (52,231/174,92).D)
	F - D	F = (52,231.D - (52,231/174,92).D^2)
	F - S	F = (174,92.S - (52,231/174,92).S^2)

Source : Analysis Results

Road Conditions in the School Safe Zone Area

The results of the model of the equation of the relationship of S-D and the correlation on the road section of the path condition with the existence of the School Safety Zone area can be seen as follows :

Table 3. Model of the Equation of Kecepatan – Density and Correlation in ZoSS Areas

Relationship	Equation Model	Equation Model		r^2	R	X (smp/km)	Information
Greenshield	(-0,242x)+43,822	x =	181,083	0,8106	0,900	181,08	Very Strong
Greenberg	-5,427ln(x)+54,742	ln(x) =	10,087	0,693	0,832	24028	Strong
Underwood	$44,543e^{-0,007x}$	$e^{-0,007x}$ =	44,543	0,7964	0,892	1265,485	Strong

Source: Analysis Results

From the analysis, the most realistic density results were obtained from Greenshield modeling. So that the model of the similarity of the relationship between the characteristics of the traffic flow of each road section in the ZoSS area and the Greenshield selected model is as follows :

Table 4. Model of Similarities in Relationships Between Traffic Flow Characteristics in ZoSS Areas

Type	Relationship	Equation
Greenshield	S - D	S = (43,822 - (43,822/181,083) *D)
	F - D	F = (43,822 *D - (43,822/181,083) *D^2)
	F – S	F = (181,083*S - (43,822/181,083) *S^2)

Source : Analysis Results

Comparison of Conditions Before and on ZoSS Areas

From the calculation results using the model Greenshield, a model of the relationship between traffic speed (S) - traffic density (D) is obtained so that the Volume value (F) is obtained as follows:

Table 5. Greenshields Model Volume, Speed, and Maximum Density

Scenario	Sf	Fc	Dj
Before ZoSS	52.23 km/h	2284.05 smp/h	174.92 smp/km
Area ZoSS	43.82 km/h	1983.85 smp/h	181.08 smp/km
Percentage Decrease and Increase	Decreased by 16.10%	Decreased by 13.14%	Experienced an increase of 3.52%

Source: Analysis Results

Analysis of Service Levels and Degrees of Saturation

From the results of the modeling calculation, Greenshield modeling is obtained, so that the degree of saturation that occurs on the road section can be calculated. The following is a graph of the results of calculating the degree of saturation and the level of service :

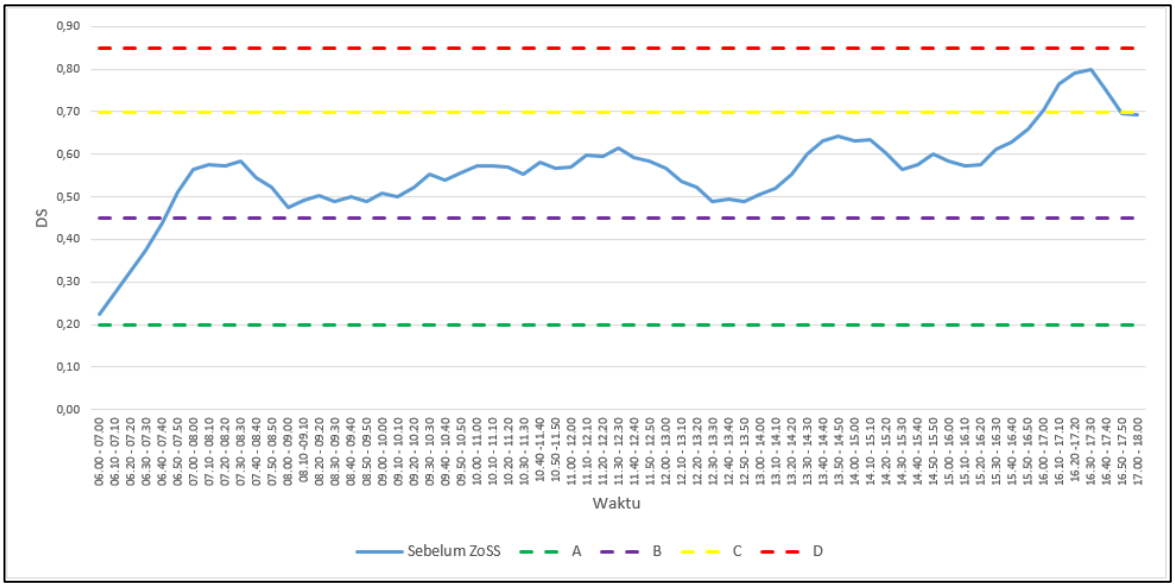

Figure 1. Service Level Index Graph Before ZoSS

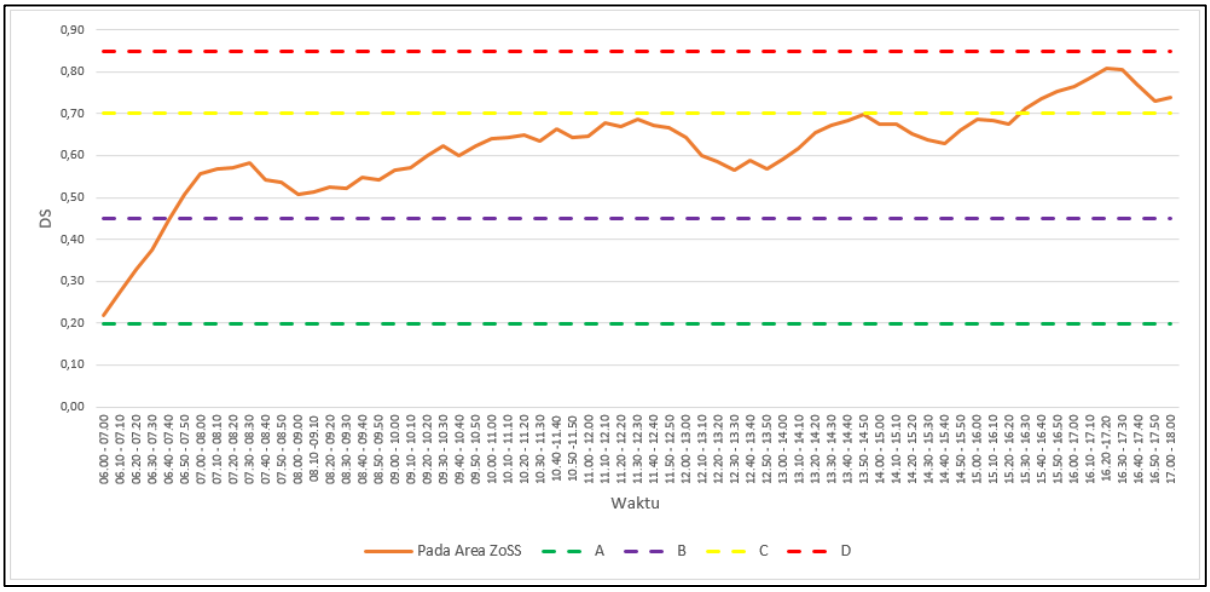

Figure 2. Service Level Index Graph on ZoSS Area

5.CONCLUSIONS AND SUGGESTIONS

Conclusion

1. The School Safety Zone has quite an effect on the performance of the road section. Based on observations that have been made, there is a significant decrease with the maximum volume decreasing by 13.14%, for the average speed there is a decrease of 16.10%, and for the maximum density, there is an increase of 3.52%. At certain times, especially during the hours when children leave or return to school, this hour has the potential to make traffic flow unstable. This occurs due to the influence of activities in the School Safety Zone, ranging from the activity of people crossing the road, stopping public vehicles, and also entering and exiting vehicles to sections of the road to make the flow limited, and the speed is reduced until obstacles can occur. But generally speaking, based on the road performance, the traffic flow is still stable.
2. Road performance obtained from the Greenshield, Greenberg, and Underwood Modeling Analysis obtained AN ITP value with a comparison of V/C in the operating hours of the School Safe Zone, in the area before the School Safe Zone obtained a DS 0 value, 49 while in the affected area of the School Safety Zone, DS 0.66 was obtained with an ITP value of C on both, which based on the Regulation of the Minister of Transportation No. KM 14 of 2006 means Stable Current, but the speed and movement of the vehicle are controlled, the driver is limited in choosing speed. So the ITP results obtained in the School Safety Zone are higher than without the

influence of the School Safety Zone. With the average of the two areas, the service level index is at level C.

Suggestion

1. The Banjarbaru transportation agency is expected to pay more attention to the facilities of the School Safety Zone because for example there are several traffic signs in the School Safety Zone that are not visible or covered by trees and buildings around it so that motorists potentially do not see the signs and do not follow the existing traffic rules.
2. For the School Safety Zone marker on the road surface with ZoSS and red paint as the background, it is felt that there is too little red paint so it is feared that motorists do not know and are not aware that there is a School Safety Zone in the area.

1) For further research, it is required to do calculations for motorcycles in accordance with existing rules or regulations.

REFERENCES

Aisyah, Siti. 2021. "Analisis Kinerja Lalu Lintas Berdasarkan Permodelan Greenshield, Greenberg Dan Underwood Pada Ruas Jalan Raya Batulicin Tanah Bumbu"

Direktorat Jendral Bina Marga (1997). Manual Kapasitas Jalan Indonesia(MKJI). Jakarta: Bina Karya.

Dirjen Perhubungan Darat. 2018. Keputusan Dirjen Perhubungan Darat No. SK.3582/AJ.403/DRJD/2018 Pedoman Teknis Pemberian Prioritas Keselamatan Dan Kenyamanan Pejalan Kaki Pada Kawasan Sekolah Melalui Penyediaan Zona Selamat Sekolah. Jakarta.

Hendra Gunawan, M., Purnawan, M., 1998, Hubungan Parameter Kecepatan, Volume dan Kepadatan Lalu Lintas Di Kotamadya Padang. Simposium Forum Studi Transportasi Perguruan Tinggi , Aula Timur ITB, 3 Desember 1998.

Kariyana, I Made dkk. 2020. "Analisis Zona Selamat Sekolah (ZoSS) Di Kecamatan Denpasar Selatan (Studi kasus : SDN 5 Pedungan Dan Sekolah Harapan)" *dalam Jurnal* (halaman. 152-153). Bali: Paduraksa.

McShane, W.R., Roess, R.P., and Prassas, E.S., 1990, Traffic Engineering, 1st ed, Prentice Hall, Inc., Englewood Cliffs, New Jersey.

Miro, F. 1997. Sistem Transportasi Kota Bandung: Bandung: Tarsito Bandung

Peraturan Menteri Perhubungan Nomor: KM 14. 2006. Manajemen dan Rekayasa Lalu Lintas di Jalan.

Radam I. F., Mulyono A. T., Setiadji B. H. (2015). Influence of Service Factors in The Model of Public Transport Mode: A Banjarmasin-Banjarbaru Route Case Study. International Journal for Traffic and Transport Engineering. Vol 5(2): 111.

Republik Indonesia. (2004). Undang-Undang Republik Indonesia No 38 Tentang Jalan. Jakarta: Skertariat Negara.

Sudjana, M., 1983, Teknik Analisis Regresi Dan Korelasi. Bandung: Tarsito, Bandung.

Sukirman, S, 1994, Dasar-Dasar Perencanaan Geometrik Jalan Raya, Nova, Bandung.

Warpani, S. 1990. Merencanakan Sistem Perangkutan. Bandung: Penerbit ITB.

Yoga, Aska Ilham Fitra. 2021. "Pengaruh Kegiatan Pasar Tradisional Terhadap Kinerja Arus Lalu Lintas Ruas Jalan Sekumpul Martapura". Tugas Akhir Bidang Transportasi, Fakultas Teknik Jurusan Sipil Universitas Lambung Mangkurat, Banjarbaru.