Yogyakarta-Magelang Road Accident Analysis Sleman District

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ABSTRACT
A traffic accident is an accident on the highway that involving vehicles with other road users resulting in human casualties and material loss. This research is expected to find out the cause of the accident traffic, especially the characteristics of the accident, the factors of the accident and the location accident prone (BlackSpot). This location is taken is Jalan Raya Yogyakart Magelang KM 01-18 Years 2018-2020. This accident-prone identification uses the Accident Equivalent Number (AEK) method and the Z-Score method. As for the results According to the study, the number of accidents in 2018 was 79, in 2019 was 140 and the year 2020 is 149 which means accidents from year to year experience enhancement. Accident-prone lanes are at KM 6-12 with AEK 728 and Z-Score results 0.920603 and at the 2nd prone location in KM 12-18 using the method AEK 551 and Z-Score method 0.143327. For further researchers, the analysis can be carefully analyzed accidents based on driving license (SIM) and accident analysis based on weather and driving speed.

Keywords: *Accident Prone Locations, AEK, Z-Score, Characteristics, Accident Factors*

1. INTRODUCTION

Sleman is one of the districts in the Special Region of Yogyakarta. Geographically, it is located between 110ÿ 13' 00" East Longitude 7ÿ 34' 51" and 7ÿ 47' 30" south latitude, with an area of 574, 82 km2, and a population of 850. 176 people in 2021. Along with the increasing population of Sleman each year, the need for transportation also increases, which result in transportation cases. Transportation cases are quite a problem environment related to imbalances in the transportation system. System Transportation consists of sub-systems between lane users and transportation facilities universal for moving around using transportation modes. Case traffic continues to grow in line with the advancement of the growth of modern technology. This growth in addition to bringing benefits to line users, among others, continues to be a lot of conveniences and conveniences in the field of transportation, giving rise to various good and negative consequences. Observing the tendency of an increase in the number of catastrophic events cause a lot of losses (life and material), so that there needs to be a study about the disaster. In this final project, I want to discuss the analysis of traffic accident on the Yogya-Magelang highway, Sleman Regency. Research This traffic accident analysis will be very useful to identify the most important the characteristics of the calamities that occur on the road section, which can later be used to reduce the number of accidents and take steps to improve safety.

Research purposes
To determine the characteristics of the accident (type of vehicle, type of accident, accident location, time of accident). To find out the factors that affect traffic accidents. To find out the accident-prone in along the Yogyakarta-Magelang highway from the welcome monument to Yogyakarta until the goodbye monument Tempel, Sleman.

Library review
Abdul Halim Dalimunthe [1], University of Muhammadiyah North Sumatra, 2017, With the title "Traffic Accident Analysis on Highway Dolok Masihul (JL. Lintas Central Sumatra) Kab. Serdang" This analysis was conducted to determine the factors causes of traffic accidents. Required data in this analysis consists of primary data and secondary data. Primary data consists of names road, number of lanes, lane width, LHR obtained from the results of a direct survey in the field. Secondary data needed is a map of the research location, and incident data traffic accident. The data obtained were then analyzed by classifying accidents based on the factors that cause traffic accidents. Main factor there was a traffic accident on Highway Dolok Masihul (Jl. Lintas Tengah

Sumatra) are humans, the age of the most traffic accident victims is 16 – 30 years, the largest number of accidents occurred at 06.00 to 06.00 19.00 as much as 63.44% which is rush hour and the work of the perpetrator of the accident in domination by men. Efforts that can be made to reduce the number accidents on Highway Dolok Masihul (Jl. Lintas Tengah Sumatra), namely: provide traffic education and strict sanctions on road users who violate traffic regulations and the installation of signs must comply with Decree of the Minister of Transportation Number 61 of 1993 concerning Traffic Signs.

Andi Darmawan [2], With the title "Regional Analysis" Accident Prone (BLACK SPOT) on the Jagorawi Toll Road" Identification of vulnerable locations accidents using the Accident Equivalent Rate (AEK) method, the location identified as prone to accidents on the Jakarta – Ciawi route, namely Km 08 - 09, Km 22 - 31, Km 33 – 37 and Km 39 – 43. While on the Ciawi – Jakarta route, namely Km 04 – 09, Km 21 – 23, Km 28 – 29, Km 34 – 35, Km 40 – 41 and Km 44 – 45. Characteristics accidents using data approach analysis and statistical analysis, namely: Weather sunny, lane one, 00.00 – 06.00, lack of anticipation, own accident and mini bus. Proposed handling carried out in accident-prone locations to reduce

the number of accidents is with the Minimum Service Standards (SPM) field toll road safety, such as traffic signs, street lighting, squeaky tape (rumble strip) and other accessories.

Yogi Oktopianto [3], Titled "Accident-Prone Area Analysis (Black Site) and Accident-Prone Points (Black Spot) Lampung Province, the method used in this study includes the method EAN, Z-Score, Accident Frequency to analyze the determination of vulnerable areas accidents and Cumulative Summary method to analyze accident-prone points. The results showed that out of 93 roads, there was 1 road which was the highest black link in each road segment status. Accident-prone areas (black sites) are: Central Sumatra Highway and accident-prone points (black spots) at KM 18-26 influenced by land use, road geometry and traffic signs.

Gito Sugianto(2014) conducted a research entitled The Characteristics of Later Calamities Cross and Blackspot Position in Kab. Cilacap. The research uses the procedure AEK weighting (Disaster Equivalent Figure) Based on the results of the analysis obtained if the characteristics of traffic accidents in Cilacap Regency from 2006 s. d 2008 sourced from gender dominated by men. Motorcycles are vehicles who often participate in the disaster accompanied by passenger cars. Sourced on position calamities so that most of the disasters occur on inter-city routes and main aspects The trigger for disaster is human. Position prone to traffic accidents on the segment The urban routes are the Rinjani route, the Urip Sumoharjo route and the Gatot Subroto route. Position prone to traffic accidents on the inter-city route, namely the Jeruk Legi highway, the Cimanggu highway section, the Purwokerto-Banjar highway section, Wanareja District and the Kedungreja-Tambakereja highway section, Cilacap.

Jesima Nathanael Samosir (2018), conducted a research entitled "Objection" Factors Causing Traffic Accidents in North Sumatra in 2016. Research This method uses secondary data collection methods. The results of the research are The results of the study show that the driver factor causes a traffic accident The most dominant crosses were pain (33.04%), drowsiness (32.4%), conditions tired (23.7%), careless condition (10.8%), disorderly condition (0.01%) are factors highest cause of traffic accidents. Then on the most dominant road factor namely obstructed view (18.4%), sharp turns (17%), no signs (16.9%), no lights (15.4%), holes (8.17%), no signs (7.34%), slippery (6.87%) damaged (6.5%), damaged markings (2.14%), and damaged signs (1.3%). Then the vehicle factor the most dominant is the steering is not good (44.6%), brakes do not work (18.07%), lighting is not good (13.6%), headlights don't work (7.8%), tires are not good (4.69%), taillights not working (4.1%), lights dazzling other vehicles (2.7%), rear axle broke (2.2%), and front axle broke (1.93%). On natural factors that the most dominant conditions were rain (97.9%), and fog (2.04%). While the factor technology did not cause traffic accidents in North Sumatra in 2016.

Andi Halim Delamunthe 2020, conducted a study with the title Analysis Traffic Accident On Highway Dolok Masihul (Central Cross Road Sumatra) Kab. Serdang. The study used the AEK (Accident Equivalent Rate) method. used to analyze the highest accident point (Black Spot) that occurred in the area of which will be reviewed. The results of the study are the main factors of past accidents traffic on Jalan Raya Dolok Masihul. The largest percentage resulting in the occurrence of accidents is due to the driver's factor of human negligence or human error itself such as carelessness, disobeying the rules that have been set. The percentage of causes of traffic accidents due to the driver is 32.26%. In addition to the driver, the road factor is also very influential, which is indicated by the value of percentage of 25.81%.

Vrischa Natalia Arung (2020) conducted research on Regional Determination Prone to Traffic Accidents in the City of Surabaya. This study uses the z . method scores. The results of this study are quality control statistics are used as a method to determine accident-prone areas. Quality control statistics are the limit the value can be calculated using the BKA method or the Upper Control Limit. If a road segment has a traffic accident rate above the BKA line. Z-score is used for determine the location of accident-prone areas. Z value can be said how standard long deviation of the distance between the data values and the mean (hasan, 2001).

2. METHODS

Ingredient

The data collection carried out in this study used data secondary and primary, namely: Secondary Data, Traffic accident report data, including accident data for 3 years, starting from 2018-2020.

3. RESULTS AND DISCUSSION

Accident Characteristics

The research was conducted on the Yogyakarta-Magelang road section for 3 years with observations to record violations committed by road users who can lead to traffic accidents. Characteristics of traffic accidents on the highway Yogyakarta-Magelang which is secondary data obtained from the Sleman Police. The data is used to describe the tendency of accidents that occur in Yogyakarta-Magelang highway.

The number of traffic accidents on the Yogyakarta-Magelang highway in 2018-2020 did not experience a decline. The amount is due to the number of vehicle ownership that continues to increase and is not accompanied by facilities supporting road users in driving on the highway. Apart from these factors, the level of the discipline of road users in driving is still very low and it is still wrong One reason for the high incidence of accidents that occur on the highway Yogyakarta-magelang.

Table 5.1 Number of accidents on the Yogyakarta-Magelang Highway

Year	2018	2018	2020
Number of accidents	79	140	144

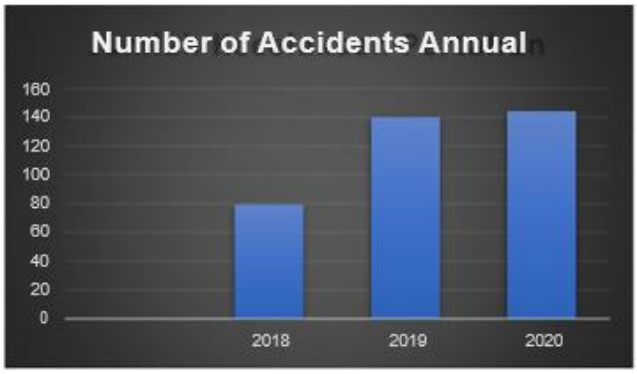

Figure 5.1 Number of accidents per year

Table 5.1 shows the number of accidents on the Yogyakarta-Magelang Highway experienced an increase, this table is useful for analyzing the high number of accidents and analyze the cause of the accident. Based on By Type of Victim Characteristics of accidents

By type of victim

on the Yogyakarta-Magelang highway carried out with the type of victim, namely: Died (MD), Seriously Injured (LB), Wounded Light (LR). The large number of human victims in traffic accidents for more details can be seen in table 5.1

Table 5.2: the number of victims of traffic accidents on the Yogyakarta-Magelang highway (Sleman Police in 2018-2020).

NO	Accident victim	Amount			Percentage %		
		2018	2019	2020	2018	2019	2020
1	Died	9	8	10	11%	6%	7%
2	Serious Wounds	0	0	44	0%	0%	31%
3	Minor Injuries	70	132	90	89%	94%	63%
Amount		79	140	144	100%	100%	100%

By Time of Occurrence

Characteristics based on the time of incident on Jalan Raya Yogyakarta-Magelang carried out with light time (06.00-16.00) and Dark time (19.00-05.00). Amount of human casualties in traffic accidents can be seen in Table 5.3

Table 5.3: Number of Traffic Accidents on Jalan Raya Yogyakarta Magelang based on the time of the incident (Sleman Police in 2018-2020)

No	O'clock	Amount			Total	Percentage%
		2018	2019	2020		
1	06.00-19.00	48	75	87	210	62%
2	19.00-06.00	37	48	45	130	38%
Total		85	123	132	340	100%

Accidents often occur during light hours, 06.00-19.00 in percentage figures 64% and during dark hours, at 19:00 to 06:00, the percentage is 36%. This matter shows that during the daytime the road is always crowded with vehicles. Para the driver uses his vehicle at high speed., while the conditions road that is almost all on asphalt. But if you are careless and the riders don't Be aware of traffic conditions, this has the potential to result in an accident.

By vehicle

Characteristics based on vehicles on the Yogyakarta-Magelang highway carried out by type of vehicle, namely: motorbikes, mini buses, public transportation, pickups, trucks, wind bikes, pedestrians. Can be seen in Table 5.3

Table 5.4 vehicles involved in accidents on the Yogyakarta-Magelang highway (Polres Sleman 2018-2020)

No	Vehicle Type	Amount			Total	Percentage%
		2018	2019	2020		
1	motorbike	131	145	136	412	70%
2	Mini buses	30	24	24	78	13%
3	Pick-ups	1	1	6	8	1%
4	Public transportation	5	3	3	11	2%
5	Trucks	6	16	6	29	5%
6	wind bikes	3	2	4	9	2%
7	Pedestrians	13	15	11	39	7%
Total		189	206	190	586	100%

Based on the type of accident occurred

Some of the vehicles involved in the accident on the Yogyakarta highway Magelang. Can be seen in table 5.4

Table 5.5 Types of traffic accidents that occur (Polres Sleman 2018-2020)

No	Day	Amount			Total	Percentage
		2018	2019	2020		%
1	single accident	3	5	13	21	6%
2	Crashing Fixed Object	0	2	3	5	1%
3	Hitting Pedestrians	10	8	11	29	9%
4	Front-Rear Collision	31	21	31	83	24%
5	Front-Side Collision	20	62	49	131	39%
6	Front-Front Collision	11	8	0	19	6%
7	Hit and Run	4	11	10	25	7%
8	Side Crash Side	6	5	12	23	7%
9	Wind Bike Crash	0	1	3	4	1%
Total		85	123	132	340	100%

By location and number of accidents

Accidents based on the type of location on the Yogyakarta-Magelang highway. It is carried out from the KM 1-18 road section with the aim of determining the Black Spot point. Can be seen in table 5.6

Table 5.6 Roads and the number of traffic accidents in 2018-2020 (Polres Sleman (2018-2020)

No	Road Section (KM)	Number of Accidents			Total	Percentage
		2018	2019	2020		%
1	0-6	14	18	17	49	14%
2	6-12	42	64	63	169	50%
3	12-18	29	41	52	122	36%
Total		85	123	132	340	100%

Based on accident factor

Traffic accidents generally occur due to the following factors: work in unison, such as violations or carelessness of the users road (driver and pedestrian), road conditions, vehicle conditions, weather and views which is hindered. Driver error is a major factor in many accidents between fatigue, inattention, inattention, and boredom, but the highest the value of traffic accidents in 2018-2020 is dominated by human factors and vehicle condition. Can be seen in table 5.7

Table 5.7 Traffic accidents by factors causing accidents

No	Accident Factor	Amount			Total	Percentage %
		2018	2019	2020		
1	Human	66	100	102	268	79%
2	Vehicle condition	12	13	17	42	12%
3	Street Environment	5	3	6	14	4%
4	Weather	2	7	7	16	5%
	Total	85	123	132	340	100%

From the analysis carried out, it was concluded that the factors that The cause of traffic accidents is the error factor human/driver himself (Human Error), vehicle factor and lack of clear infrastructure on accident-prone roads. This can be seen in the analysis based on the characteristics of the accident conducted. On the characteristics of an accident with a front-side collision, it identify the driver's own negligence. Likewise, a motorcycle type vehicle which is a type of vehicle that with the highest number of involvement in accidents, driver behavior factor Motorized vehicles also have a level of security that is less careful in driving and motorcycle vehicles that have a minimal level of security, as well as The most frequent time of traffic accidents is busy time 06.00-19.00 on at that time the traffic conditions were very crowded and resulted in Many traffic accidents are the result of drivers being less careful in driving drive.

Accident Equivalent Number Analysis

This method is used to analyze the highest accident point (Black Spot). that occurs at the location to be reviewed. (AEK) Accident Equivalent Figures, namely weighted figures for the accident class. AEK calculation seen by level fatality of traffic accidents and accidents that result in losses material.

An example of calculating AEK on roads 0-6 is

AEK :12MD + 3(LB+LR) + K……(1)

:12(1) + 3(0+53) + 41

:212 people

From table 5.8, the highest ranking on the Yogya-Magelang Road Section is located at KM 06 -KM 12 diangka 728.

NO	segment Street (KM)	Total Lacquer	Number of Accidents			AEK			AEK	RANK
			MD	LB	LR	12Xmd	3x(LB+LR)	K		
1	0-6	49	1		53	12	159	41	212	3
2	6-12	169	9		163	108	489	131	728	1
3	12-18	122	4		133	48	399	104	551	2

Furthermore, to identify accident-prone areas using Z-Score analysis . The formula is to find out the average accident and area prone to accidents on the Yogya-Magelang Road, Sleman Regency.

$$Zi = \frac{\quad}{\quad}$$

(2)

Zi = Accident Z-Score score

Xi = Accident Rate per Segment

S = Standard Deviation

X = Average Total Accident Rate

To find out the results of the Z-Score method can be seen in table 5.9

Table 5.9 The results of the analysis of accident-prone points using the Z-Score . method

No	segment Street (KM)	Number of Accidents			Total Z-Score		Category
		2018	2019	2020			
1	0-6	14	18	17	49	-1.06393	Not Vulnerable
2	6-12	42	64	63	169	0.920603	Very Vulnerable Accident
3	12-18	29	41	52	122	0.143327	vulnerable Accident

4. CONCLUSION

1. The characteristics of the biggest accidents in 2018, 2019 and 2020 are bicycles motorcycles became a large number by vehicle, as many as 412. And Next, the biggest type of accident is front-side as many as 131. And based on time the largest number of events occurred during the day at 06:00-19:00 as many as 210.
2. The main cause of traffic accidents on Jalan Raya Yogyakarta Magelang in 2018,2019, and 2020 based on the data obtained accidents are dominated by the driver's factor of human negligence or (Human Error). Percentage of accidents with driving negligence reached 268. And the vehicle factor reached 42.
3. Accident-prone locations on the Yogyakarta-Magelang Highway are in KM 6-12 using the AEK 728 method and the Z-Score method 0.920603. At location prone to 2 in KM 12-18 using the AEK 551 method and the Z-Score method 0.143327.

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