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BLACKSPOT IDENTIFICATION USING AEK AND BKA METHODS ON NATIONAL ROAD IN JAVA ISLAND

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ABSTRACT

Traffic accidents tend to increase and are still the main problem in the implementation of road transportation in Indonesia, especially on the island of Java. Based on the results of the population census, in 2016, 2017 and 2018 the average population on the island of Java reached 148 million people. As much as 56.1% of the total population in Indonesia is concentrated on the island of Java. This has an impact on increasing mobilization and the need for transportation so that traffic accidents tend to increase. Based on secondary data from the Korlantas Polri, the number of accidents increased by 5% from 2016 to 2018. The lack of handling and repairs in traffic accident-prone locations is one of the causes of frequent traffic accidents. Therefore, greater attention is needed on locations where traffic accidents often occur in order to reduce the number of traffic accidents every year. This study aims to identify LRK on national roads in Java with a frequency of 2 events per year, analyze the characteristics of accidents using the Accident Equivalent Rate and Upper Control Limit method. Data on victims of Death (D), Serious Injury (SI), Minor Injury (MI) and Material Losses (ML) in 2016, 2017 and 2018 were obtained from the Korlantas Polri. Based on these data, the AEK value is calculated and analyzed to obtain LRK using the BKA method. The results of the analysis show that the total LRK in Java is 1301 LRK in 2016, 1278 LRK in 2017 and 1309 LRK in 2018 so there are 1296 LRK on average per year. Analysis of traffic accident data using the AEK and BKA methods in 2016 obtained the highest AEK value found in the province of East Java with an AEK value of 277024 events; Central Java with an AEK value of 183813 events and West Java with an AEK value of 139677 events, therefore there are 3 provinces with the highest number of Accident Prone Location (LRK) in Java, namely East Java, Central Java and West Java.

Keywords: *blackspot, accident prone location, accident equivalent rate, BKA*

1. PRELIMINARY

Indonesia is still one of the countries with the highest traffic accident rate in the world, according to WHO (World Health Organization) Indonesia is ranked 3rd in the world. According to WHO in 2009, road traffic accidents were the 9th leading cause of death in the world in 2004 and are predicted to be the 5th leading cause of death in the world by 2030, after heart attack, stroke, tuberculosis, and ARI. Traffic accidents can be caused by several factors, both from road users, vehicles and roads and the environment in which they pass, so that

traffic accidents are difficult to predict when and where they occur.

Lack of handling and repair in traffic accident prone locations is one of the causes of frequent traffic accidents. Therefore, greater attention is needed on locations where traffic accidents often occur in order to reduce the number of traffic accidents every year. From the traffic accident data, sometimes there is a location that is considered frequent traffic accidents. The location is called the Accident Prone Location (LRK/Blackspot). If there is a traffic accident with a repeated frequency on a road, it is necessary to handle repairs at that location. The location needs to be identified further. One method to determine traffic accident-prone locations is to use the Accident Equivalent Rate (AEK) method which considers several variables in its calculation, such as the number of victims' severity levels (died, seriously injured and slightly injured). Each severity level has a weighting coefficient against the type of severity to obtain the AEK for that location. Locations that receive AEK with a frequency of 2 times the incidence of accidents per year are categorized as Accident Prone Locations (LRK).

2. THEORETICAL BASIS

Traffic Accident Definition

Based on Law Number 22 of 2009 concerning Road Traffic and Transportation, it is stated that a traffic accident is an unexpected and unintentional event on the road involving a vehicle with or without other road users resulting in human casualties and or property loss. A traffic accident is an incident on road traffic involving at least one vehicle that causes injury or loss to the owner of the victim (WHO, 1984). According to F.D. Hobbs (1995) quoted by Kartika (2009) revealed that traffic accidents are events that are difficult to predict when and where they occur. Accidents are not only trauma, injury or disability but also death. Accident cases are difficult to minimize and tend to increase as the length of the road increases and the number of vehicles moves.

From several definitions of traffic accidents it is concluded that a traffic accident is an unexpected and unwanted road traffic event that is difficult to predict when and where it will occur, involving at least one vehicle with or without other road users causing injury, trauma, disability, death and/or loss of property to the owner (victim).

Accident Prone Location (LRK)

Based on Pd T-09-2004-B, Department of Settlement and Regional Infrastructure (Puslitbang PU, 2004), Accident Prone Locations are locations where the number of accidents is high with the incidence of repeated accidents in a space and relatively the same range caused by a certain cause.

Death

Accident victims are confirmed to have died as a result of a traffic accident within a maximum period of 30 (thirty) days after the accident (PP RI No. 43 of 1993 concerning Road Traffic and Infrastructure).

Serious Injuries

Accident victims who due to their injuries suffer from permanent disability or have to be hospitalized in a hospital within more than 30 (thirty) days after the accident occurred (PP RI No. 43 of 1993 concerning Road Infrastructure and Traffic).

Minor Injuries

Accident victims who suffer injuries that do not require hospitalization or who must be hospitalized for 30 (thirty) days (PP RI No. 43 of 1993 concerning Road Infrastructure and Traffic).

National Road

National roads are arterial and collector roads in the primary road network system that connects between provincial capitals and national strategic roads, as well as toll roads.

Accident Equivalent Rate (AEK)

Accident Equivalent Rate (AEK) is a numerical economic scale for weighing the accident rate based on the severity of the

victim. AEK is calculated by comparing the estimated economic losses caused by various levels of accidents, namely death (D), serious injuries (SI), minor injuries (MI) or material losses (ML). In determining the AEK value, the weighting of the victims due to accidents is used. For example, accidents that result in death are given a weight of 100, accidents with serious injuries are given a weight of 20 and accidents with minor injuries are given a weight of 5. From this weighting, a new accident ranking list is obtained. This method was proposed by the Directorate of Road Safety Development.

AEK : (100xMD) + (20 x LB) + (5 x LR) + (1 x KM)

Batas Kontrol Atas (BKA)

BKA is an equation method used to find the limit value of the feasibility interval.

BKA : C + 3 C

3. RESEARCH METHODOLOGY

In this study, to determine the Accident Prone Locations, which are located on the National Road on the island of Java.

Figure 1. Research Site map

Determination of accident-prone locations itself is carried out by taking into account:

1. Number of traffic accidents;
2. Number of victims who died;
3. Number of seriously injured victims;
4. Number of victims with minor injuries;
5. The amount of material loss;

Accident Prone Location is a location that gets the equivalent number of accidents with a frequency of 2 times the incidence of accidents per year and it is a location that lacks handling and repair so that the frequency of traffic accidents is high. This study uses secondary data, which is data obtained from existing sources, which are obtained from the Korlantas Polri agency whose scope of work is related to evaluating accident-prone locations which in this case emphasizes national roads.

4. RESULT AND DISCUSSION

The LRK analysis was carried out using secondary data obtained from the Korlantas Polri. The data obtained consisted of the number of victims who died (MD), victims of serious injuries (LB) and victims of minor injuries (LR) as well as material losses (KM). Based on Pd T-09-2004-B, the Department of Settlement and Regional Infrastructure (Puslitbang PU) LRK is a location where the number of accidents is high with the incidence of repeated accidents in a relatively similar space and period caused by a certain cause. So in the next stage, screening the number of accidents 2 times per year.

Table 1. Accident Screening

No	Provinces	Number of Accidents			Total	Number of Accidents ≥ 2 times per years			Total Accident Prone Location
		2016	2017	2018		2016	2017	2018	
1	Banten	1871	1724	1499	5094	61	63	69	193
2	Jakarta	5909	5640	5883	17423	127	128	132	387
3	Jabar	7585	7382	7602	22569	267	261	265	793
4	Jateng	19996	17676	19191	56863	388	380	383	1151
5	DIY	3814	4226	4728	12768	49	48	45	142

No	Provinces	Number of Accidents			Total	Number of Accidents ≥ 2 times per years			Total Accident Prone Location
		2016	2017	2018		2016	2017	2018	
6	Jatim	23101	24379	24757	72237	409	398	415	1222

Source: Analysis, 2022

Table 2. LRK Based On 2016 BKA Method

No	Provinces	Number Of Accident	Victims			AEK	Rank	BKA
			Death	Serious Injuries	Minor Injuries			
1	Banten	61	284	214	530	35391	5	35913
2	Jakarta	127	598	441	882	73157	4	35913
3	Jabar	267	1187	676	1438	139677	3	35913
4	Jateng	388	1472	1278	2133	183813	2	35913
5	DIY	49	179	168	191	22264	6	35913
6	Jatim	409	2289	1660	2903	277024	1	35913

Source: Analysis, 2022

From Table 2. the list of LRK based on the BKA method, a graph is obtained as follows:

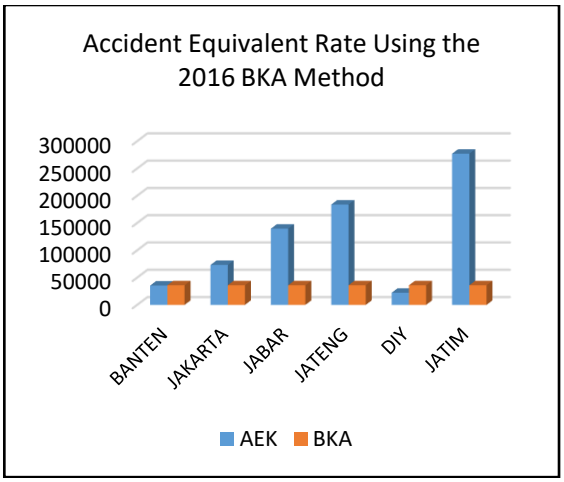

Figure 2. Accident Equivalent Rate Using the 2016 BKA Method
Source: Analysis, 2022

Based on the results of the calculation of the control limit using the BKA method as shown in Figure 2, it was identified 3 provinces on the Java Island which were classified as Accident Prone Locations (blackspot), namely East Java (with AEK value of 277024, greater than the control limit value, namely BKA = 35913 accident rate), Central Java (with AEK value of 183813, greater than the control limit value, namely BKA = 35913 accident rate), West Java (with AEK value of 139677, greater than the control limit value, namely BKA = 35913 accident rate).

Table 3. LRK Based On 2017 BKA Method

No	Provinces	Number Of Accident	Victims			AEK	Rank	BKA
			Death	Serious Injuries	Minor Injuries			
1	Banten	63	294	230	551	36818	5	34964
2	Jakarta	128	630	420	928	76168	4	34964
3	Jabar	261	1173	632	1421	137306	3	34964
4	Jateng	380	1428	1260	2100	178880	2	34964
5	DIY	48	182	148	184	22128	6	34964
6	Jatim	398	2217	1701	2993	271083	1	34964

Source: Analysis, 2022

From Table 3. the list of LRK based on the BKA method, a graph is obtained as follows:

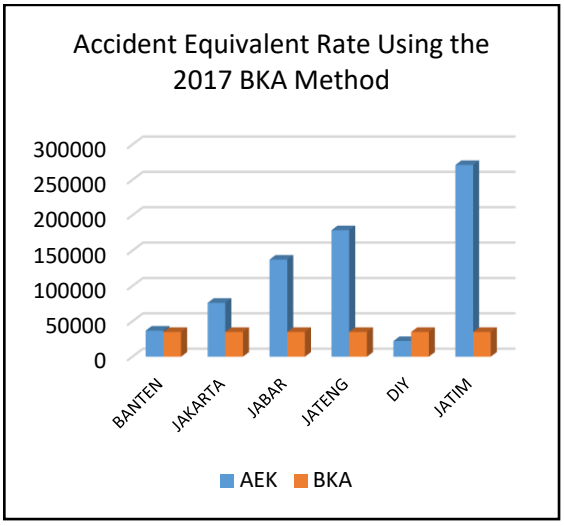

Figure 3. Accident Equivalent Rate Using the 2017 BKA Method
Source: Analysis, 2022

Based on the results of the calculation of the control limit using the BKA method as shown in Figure 3, it was identified 3 provinces on the Java Island which were classified as Accident Prone Locations (blackspot), namely East Java (with AEK value of 271083, greater than the control limit value, namely BKA = 34964 accident rate), Central Java (with AEK value of 178880, greater than the control limit value, namely BKA = 34964 accident rate), West Java (with AEK value of 137306, greater than the control limit value, namely BKA = 34964 accident rate).

Table 4. LRK Based On 2018 BKA Method

No	Provinces	Number Of Accident	Victims			AEK	Rank	BKA
			Death	Serious Injuries	Minor Injuries			
1	Banten	69	335	251	571	414444	5	35370
2	Jakarta	132	634	418	952	766652	4	35370
3	Jabar	265	1192	642	1434	1394475	3	35370
4	Jateng	383	1438	1270	2125	1802208	2	35370
5	DIY	45	172	138	162	208155	6	35370
6	Jatim	415	2501	1776	3005	3010660	1	35370

Source: Analysis, 2022

Based on the results of the calculation of the control limit using the BKA method as shown in Figure 4, it was identified 3 provinces on the Java Island which were classified as Accident Prone Locations (blackspot), namely East Java (with AEK value of 271083, greater than the control limit value, namely BKA = 34964 accident rate), Central Java (with AEK value of 178880, greater than the control limit value, namely BKA = 34964 accident rate), West Java (with AEK value of 137306, greater than the control limit value, namely BKA = 34964 accident rate).

From Table 4. the list of LRK based on the BKA method, a graph is obtained as follows:

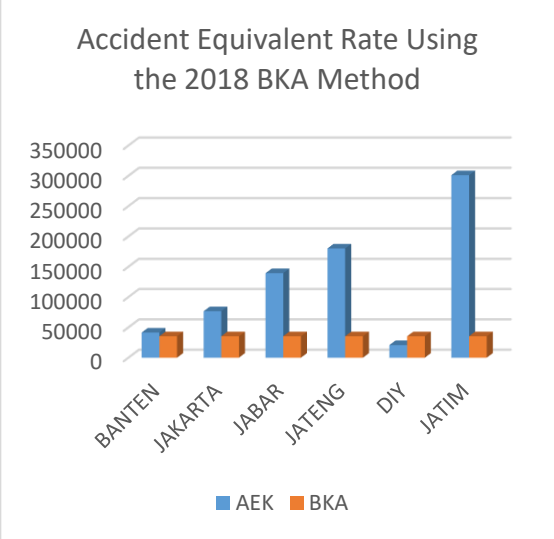

Figure 4. Accident Equivalent Rate Using the 2018 BKA Method
Source: Analysis, 2022

5. CONCLUSION

Conclusions can be drawn from this research.

1. Determination of Accident-Prone Locations on national roads in Java Island obtained 1301 LRK in 2016, 1278 LRK in 2017, and 1309 LRK in 2018.
2. There are 1296 LRK on the island of Java on average per year.
3. Analysis of traffic accident data using the AEK and BKA methods so that in 2016 the highest AEK value was found in the province of East Java with an AEK value of 277024 events; Central Java with an AEK value of 183813 events and West Java with an AEK value of 139677 events.

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