

## Anatomy Of The Traffic Accidents On The Road

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### ABSTRACT

*The location of traffic accidents on arterial roads of Makassar-Sidrap precisely at KM 173 to KM 174 from Makassar. This research aims to analyze the physical characteristics of roads, traffic sign and road markings, and (3) anatomy of a traffic accident on a road km 173 to km 174 from Makassar, using qualitative and quantitative description. The physical is complying with request IHCM 1997, except for the width of traffic lanes still requires special to handle. The degree of the saturation 0.39, free flow speed average was 67.8 km/hour with the level of service B. Traffic sign and road markings have not been adequate, there are no warning signs that should be installed an accident-prone area that could potentially be the cause of traffic accidents. Similarly, derivatives ramps warning signs, speed limits and indicate an attraction and not found the side line and dividing lanes for opposite directions at the accident-prone areas. Humans become the dominant cause of traffic accidents amounted to 77.57%. The application of the concept of forgiving road, speed management concept, and the concept of Roadside Hazard Management and the concept of Crash and Safety Barrier can improve traffic safety.*

**Keywords:** Road Transport. Traffic Flow. Accidents. Traffic Sign.

### I. INTRODUCTION

The number of traffic accident victims as death and injuries cause problems driving accident on the road is an important concern so it can't be simply ignored. Research conducted by the World Health Organization [1] concluded that the crash driving on the highway leading causes of death ranked ninth in the world and predicted that by 2020 fatalities driving on the highway will be the cause of death of the third highest in the world after the death of a heart attack and depression, further corrected and put a road traffic accident in the fifth in 2030 [2]. Based on the survey results Police traffic unit of Sidenreng Rappang in South Sulawesi, the most frequent location of traffic accidents is on the arterial roads of Makassar-Sidrap precisely at km 173 to km 174 Makassar [3]. There were 107 cases of traffic accidents from 2012 to September 2016 [4]. The picture is just the official figures because police records tend to specify the number of accidents and casualties smaller than it is actually. Even in some countries, less than half the number of fatalities from traffic collisions reported to the police [5,6].

Driving on the highway accident also caused the economic problems of the family. The financial condition of the family is involved in a traffic accident caused impoverishment because most victims are in the productive age group and head of the family [7]. Although the economic and social costs caused by traffic accidents are very high, research to combat traffic accidents still relatively small compared to other health research such as HIV/AIDS and avian influenza. It has been exacerbated in low and middle income countries for infrastructure development costs less attention to the road traffic safety aspects due to cost limitations and indifference to the problems of traffic accidents on the road [8].

This research was conducted on roads km 173 to km 174 from Makassar toward Sidenreng Rappang to describe the physical characteristics of roads, traffic sign and road markings as well as the anatomy of a traffic accident, using accident data traffic period January 2012 to September 2016 are sourced from Sidenreng Rappang's police [4].

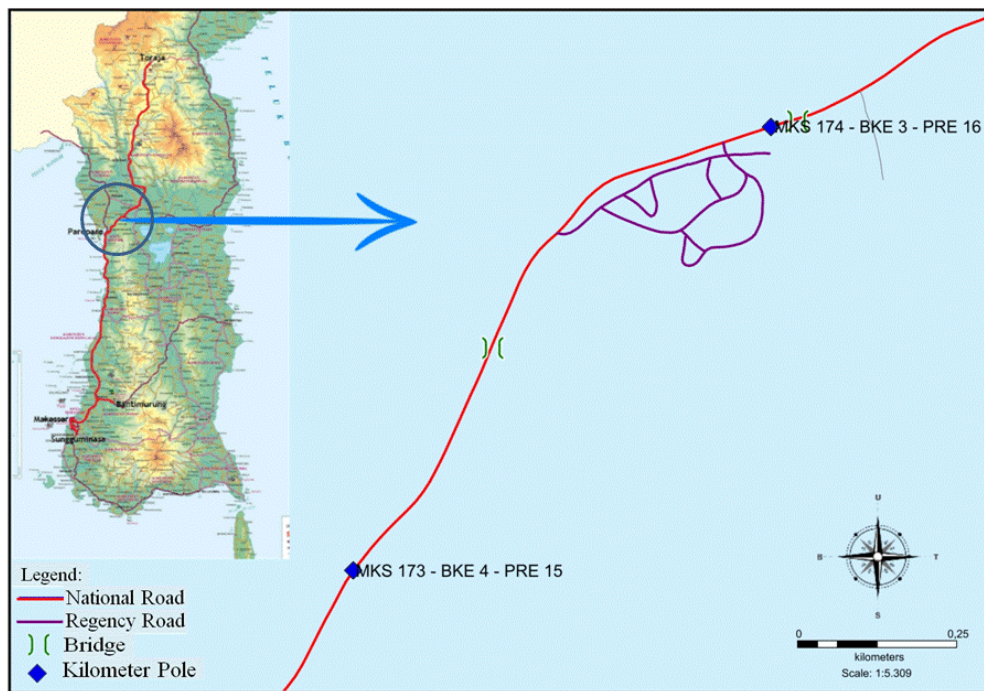


Figure 1. Locus of the research (Sideneng Rappang, South Sulawesi, Indonesia)

## II. RESULTS

The physical condition of road geometric in generally fulfill the standards of The Indonesian Highway Capacity Manual (IHCM) <sup>[9]</sup>, except for the width of traffic lanes still require special handling such as the widening of making it more effective and efficient in stream flow of traffic as in Table 1.

Table 1. Road Geometric Conditions

No.	Description	IHCM, 1997	Existing Condition	Explanation
1	The width of the traffic lanes (m)	9,5	6,84	Less fulfill
2	Road shoulder width on average (m)	1	1,35	Fulfill
3	Median	There is no	There is no	Fulfill
4	Types of alignments	Hill	Hill	Fulfill
5	Type of field	Hill	Hill	Fulfill
6	Type of road	2/2 UD	2/2 UD	Fulfill
7	Land use	No development side of the road	Gardens/Trees	Fulfill
8	Visibilities	A	A	Fulfill
9	Class side obstacles	Low	Very low	Fulfill
10	Bend radius (m)	-	-	-
11	Type of pavement	-	lithe	-

Source: The analysis of the results in 2017

Road geometric conditions, particularly the traffic lane widths still require widening, affect the number of traffic accidents can reduce the accident rate between 2 to 15% per meter widening. Widening or improvement of the surface condition of the shoulder may improve traffic safety despite having a lower level than the widening of traffic lanes <sup>[9]</sup>.

Volume peak hours in both directions Makassar-Sidrap and Sidrap-Makassar on Sunday at 17:00 to 18:00 pm with a density was 1,048 vehicles/hour or 1.188 pcu/hour. Recapitulation traffic flow from 21 to 27 November, 2016 from Makassar-Sidrap indicate the number of vehicles occurred on Saturday that 8.642 vehicles or 9.220 pcu, most light vehicles are 45% lighter vehicles, large trucks 20%, 17% motorcycles, 16% medium heavy vehicles and large buses 2%. From directions Sidrap-Makassar indicates the number of vehicles occurred on Sunday that 7.952 vehicles or 10.094 pcu, the vehicle most are light vehicles 40%, heavy vehicles middle 22%, large trucks 19%, the motorcycle 17% and large buses 2% as shown in Figure 2.

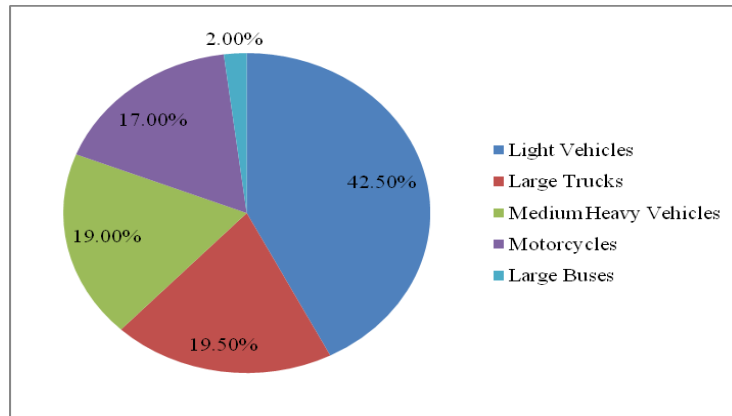


Figure 2. Percentage of vehicles in both directions

The capacity of the road is according to the calculation results of geometric, traffic survey and side obstacle 2.772 pcu/hour, peak hour volume average for both directions as much as 1.094 pcu/hour, free flow speed was 67.8 km/hour, the degree of saturation of 0.39 so that at the level of service B<sup>[10]</sup>.

On roads km 173 to km 174 there are signs warning of the bridge, exactly 50 meters before entering the bridge, warning signs bend to the right is 50 meters before entering the corner (Figure 3). However, there are no warning signs in the form of derivatives ramps, accident prone, prohibitions and commands as well as the speed of their instructions attractions on these roads. Some road segments have longitudinal markings dotted line dividing traffic lanes, markings longitudinal solid lines at corners and other road segments have no markings. The condition of the marking paint is faded so that it can no longer reflect light at night (Figure 4).



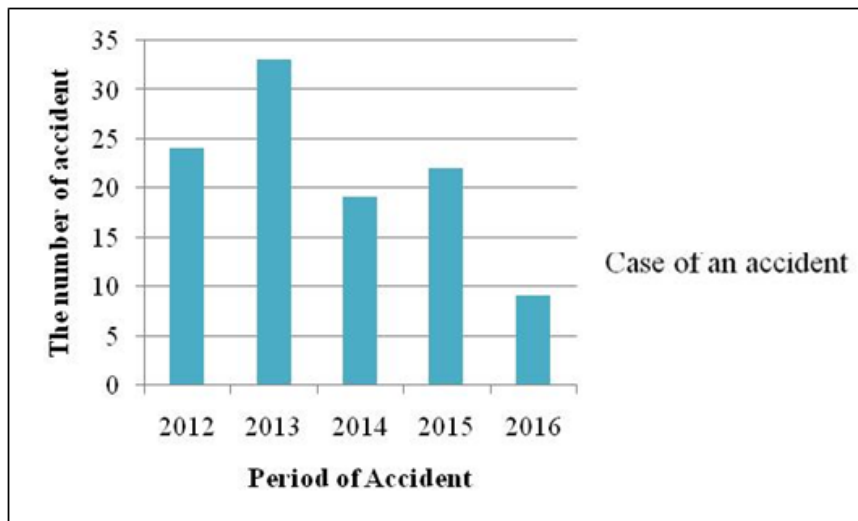
Figure 3. Bridge and bend warning signs



Figure 4. Longitudinal Mark intact lines and dotted

### Traffic Accidents

The highest number of traffic accidents by 33 cases with material losses reached Rp. 135.5 million in 2013 and 2016 (January to September) of traffic accidents lows as many as 9 cases with material losses was Rp. 17.9 million shown in Figure 5.

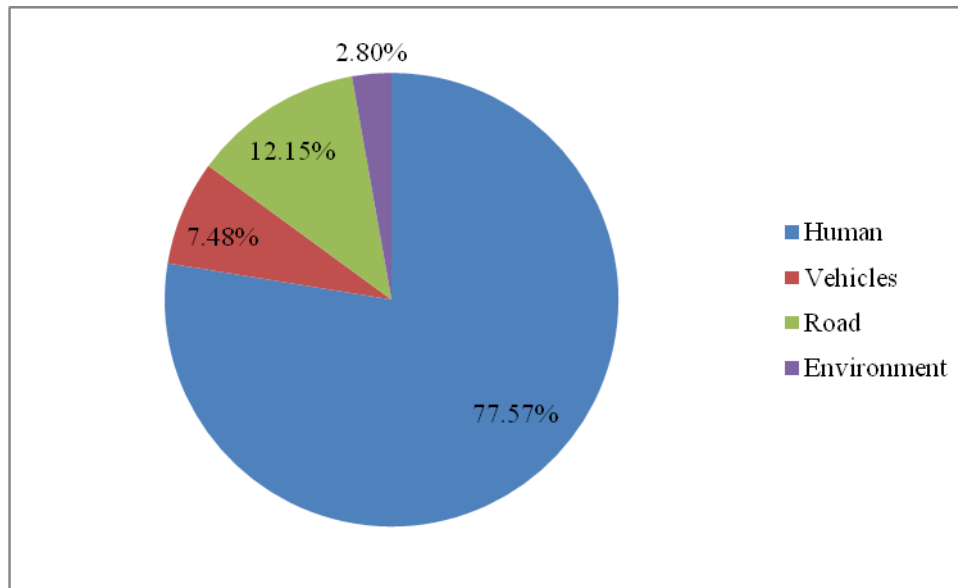


**Figure 5.** Number of cases of accidents in 2012 to 2016

The fatality of traffic accident victims 107 people died were 36.45%, minor injuries 35.51% and severe injuries 28.04%. Traffic accident victims aged 16 up to 20 years amounted to 28.04%, aged 41 to 75 years were 23.36%, aged 21 to 25 years were 16.82%, aged 26 to 30 years were 9.35%, aged > 15 years of 8.41%, aged 36 to 40 years 7.48%, and aged 31 to 35 years 6.54%. Victims of the traffic accidents male are as much as 82.24% and 17.76% female. Work victim is self-employed amounted to 50.47%, students 13.08%, university students were 12.15%, housewives 9.35%, official/Indonesian National Army/Indonesian Police 6.54%, does not work 3.74%, farmers 2, 80% and driver 1.87%. The education victims of traffic accidents is a high school education amounted to 46.73%, secondary school education was 21.50%, education Strata One was 16.82%, elementary education was 10.28% and not school 4.67%. Driver's license completeness of victims of traffic accidents that bring a driver's license amounted to 73.83% not has a license of 14.95% and does not carry a driver's license of 11.21%. Perpetrators of traffic accidents are as much as 80 people, aged 41 to 75 years were 26.25%, aged 21-25 years were 18.75%, aged 16 to 20 years were 15.00%, aged 31 to 35 years were 13.75%, aged 36 to 40 years 13.75%, aged 26 to 30 years 10.00% and those aged > 15 years 2.50%. Sex offender traffic accident that men by 92.50% and 7.50% of women. Works actors are self-employed amounted to 60.00%, drivers 21.25%, Official/Indonesian National Army/Indonesian Police 7.50%, students 6.25%, housewives 2.50%, farmers 1.25% and does not work 1.25%. Education perpetrators of traffic accidents which amounted to 35.00% of secondary school education, elementary education was 25.64%, high school education was 23.75%, education Strata One was 11.25% and not school 5.00%. Driver's license completeness perpetrators of traffic accidents that bring a driver's license amounted to 88.75% did not bring a driver's license 7.50% and did not have a driver's license 3.75%. The lack of warning signs, speed limit signs and signs for instructions affects towards an increasing number of accidents due to the user to drive a vehicle without a lack of clear information. Position signs should be placed in a position that is easily visible to the driver. Street lighting also affects the number of accidents, especially at night until early morning. In addition, there is no side line which aims to inform the vehicle lane boundaries and dividing lane opposite direction that serves to guide road users to not passing lane has been determined that could potentially cause an accident<sup>[5]</sup>. Therefore, the necessary provision of signs and road markings are able to minimize road user error that can reduce the severity of casualties due to accidents.

### Conditions of the Traffic Accidents

Based on data from traffic accidents in 2012 to September 2016, there were 107 cases occurred during the day 36.45%, mornings 31.78%, evenings 19.63% and early morning 12.15%. The position of the front-end collisions 67.29%, behind-ahead hit 17.76% and 14.95% out of control. This type of vehicle involved in a traffic accident is a motorcycle with a light vehicle and truck 47.66%, motorbikes by 28.04%, light vehicles and trucks with light vehicles 9.35%, single accident 6.54%, light vehicle and trucks with pedestrian 4.67% and a motorcycle with a pedestrian 3.74%. The dominant cause of traffic accidents is the human factor 77.57% as shown in Figure 6.

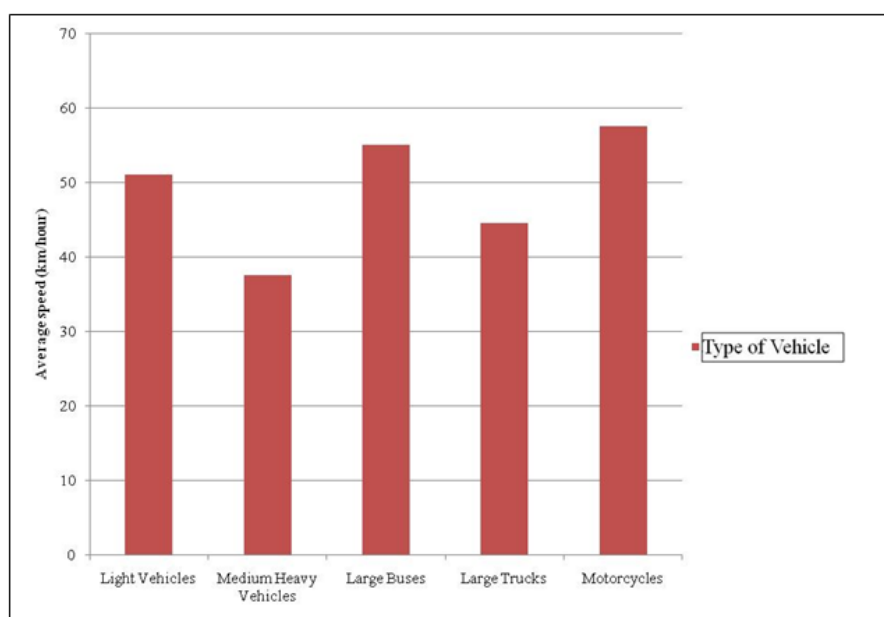


**Figure 6.** Percentage of the causes of traffic accidents

The human factor in question is the driver and the pedestrian. Driver errors become a major factor due to fatigue, sleepiness, mental readiness, physical fitness, the influence of liquor and drugs that open the possibility of traffic accidents is fatal for the driver and other vehicles on the road <sup>[11]</sup>. Traffic accidents occur to pedestrians due to the negligence of pedestrians crossing itself is the sudden and walking paths using the vehicle <sup>[5]</sup>. This requires the development and dissemination in order to improve road safety.

Along interference of the way in the form of rows of large trees and dense are very difficult to be moved or removed, and can be a very significant danger when outside the free zone. The length of the hazard increases the likelihood of a vehicle that lost control and bumped into some danger of having a high accident rate regardless of the speed of the vehicle. The length of this disruption requiring safety fence is capable of directing road users to remain on track and in case of accident caused no casualties. Safety concept that fits on roads km 173 to km 174 Makassar is the concept of forgiving road, Speed Management, Roadside Hazard Management and Conflict Fence/Safety <sup>[8]</sup>.

From Figure 7 it can be concluded that the rate of all types of vehicles under the speed limit free flow the rise and fall that has been set by IHCM <sup>[9]</sup>, but the need for regulation in the form of guidelines and rules on the minimum speed and the maximum to keep the driver not to exceed the maximum speed limit or noticed the ideal speed limit in to maneuver on the road <sup>[8]</sup>.



**Figure 7.** The average speed of vehicles in both directions

### III. CONCLUSION AND RECOMMENDATION

The physical condition of road geometric fulfills the IHCM standards, except for some traffic lanes need special handling. The degree of saturation ranges 0.39 and free flow speed was 67.8 km/hour. Thus, the level of service is at the level of service B. Traffic sign and road markings insufficient, particularly in areas prone to traffic accidents. The number of traffic accidents and material losses from 2012 to September 2016 decreased. Traffic accidents generally occur during the day and dominated by human factors.

Victims and perpetrators of traffic accidents are the majority of offenders aged 16 to 20 years and 41 to 75 years of age, male gender, occupation self-employed, educated past high school and junior high and generally have a driver's license. Traffic accident in 2012 up to September 2016 mostly hit the front and the majority of vehicles involved in traffic accidents are a motorcycle with a light vehicle, medium heavy vehicles, large buses and trucks

To improve traffic safety in areas prone to traffic accidents should be carried widening the carriage way and installation of a flashing light and a mirror bends. Installation of warning signs accident-prone areas, a ban on the speed limit and orders regarding the speed limit at a minimum, an indication of attractions, manufacture and maintenance of road markings, conduct training and dissemination of traffic safety on the road as well as the application of the concept of gracious roads, management speed, management roadside hazard and fence conflict/safety.

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