

VICTIM FATALITY STUDY OF TRAFFIC ACCIDENT AT KM SBY 106+200 (JALAN PANTURA PROBOLINGGO- SITUBONDO) IN EFFORTS TO REDUCE THE TRAFFIC ACCIDENT RISK

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Abstract

An accident occurred between a bus and a truck on Jalan Pantura Probolinggo-Situbondo. As a result, a fatal accident occurred, ten people died instantly at the scene, and nine others suffered minor injuries. Therefore, the cause of the accident has to be revealed. This research will discuss the main causes that occur prominently. The results showed that some of the factors that became prominent hazards were truck dimensions, bus speed, geometric conditions, road equipment, and human factors, and driving time. ROH dimensions, rear axle shift, and front body dimensions on the truck violate PP No. 55 of 2012 concerning vehicles Article 54. This is exacerbated by the fact that the truckload is 25 tonnes (exceeding the load limit of 18 tonnes). Field investigations show that the bus's last gear transmission is in 6th gear, indicating a high-speed range of 80-100 km/hour. In terms of bus condition, the bus body is reconditioned with an iron plate with corrosion. The road's cross-section (superelevation) condition, which is only 3%, is one of the hazards. The results show that the total time for the bus driver to be was 8 hours. However, there are conditions where the rest time every 4 hours of travel is not fulfilled. Recommendations that can be given are in the form of geometric road improvements and road equipment.

Keywords: accident, potential hazards, victim fatality

INTRODUCTION

Traffic accidents are one of the leading causes of death globally, namely 1.25 million people per year (WHO, 2015). The number of accidents with fatalities from 2009 to date does not show a decrease. Traffic accidents can occur due to several factors, namely driving at high speed, carrying out activities that can interfere with driving concentration, fighting the flow, and so on (Korlantas Polri, 2019). A study by Sugiyanto (2010) states that with the high rate of road traffic accidents, the losses incurred are also very high in the form of victims of life or property. In a study, traffic accidents' main cause is the lack of discipline in road users (Zanuardi and Suprayitno, 2018). Factors that are considered to cause accidents are human, vehicle, and environmental factors (Goniewicz *et al.*, 2016).

A prominent accident occurred on Jalan Pantura Probolinggo-Situbondo, Curahsawo Village, Gending District, Probolinggo Regency, East Java Province, on July 14, 2017, 02.30 WIB. Based on the Police Report, it is suspected that Hino Truck No. Pol DR 8600 AB, coming from the west (Surabaya) to the east (Bali), went too far to the right and took up part of the road. Meanwhile, from the east to the west, Bus Medali Mas No. Pol N 1730 UA to

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Malang is moving at high speed. As a result, there was a fatal accident, 10 people died instantly at the scene, and nine others suffered minor injuries. Bus drivers and truck drivers themselves survived this accident. Therefore, investigations regarding road conditions and the causes of these accidents need to be known to reduce accidents on these roads. This research will discuss the main causes of prominent accidents that occur.

METHOD

In investigating and determining the right recommendations for traffic accident prevention, it is necessary to have a thinking framework in the study. The steps taken in this study consisted of:

1. **Problem Identification:** In this study, the identification process was carried out by analyzing the incident's location and the chronology of the incident based on the police report. Besides, the identification results are also compared with the literature and applicable laws and regulations.
2. **Field visits:** The hypotheses generated from the identification results are then compared with the field visits' results. Field visits are carried out to find out firsthand and in detail about the incident's location, which includes the geometric conditions of the road, road markings, edge guards, road pavements, signs, etc.
3. **Data Collection:** The data collected includes secondary data in the form of police reports. Primary data is collected in the form of truck vehicles' dimensions, load weight, geometric conditions of roads, pavements, signs, potential hazards, road markings, etc.
4. **Data Analysis:** After the data is collected, the data are analyzed to determine the causes of prominent accidents by conducting studies on various literature and applicable laws and regulations.
5. **Recommendations:** Recommendations are given to improve road safety and minimize similar incidents from occurring in the future.

RESULTS AND DISCUSSIONS

Information on Victims and Accidents Around the Location

The number of victims was 19 people who came from passengers on Bus N-7130-UA. Ten people died, two people were seriously injured, and seven people were slightly injured. One of the victims who died was a foreign national (WNA) who came from Austria.



Figure 1. The condition of the buses and trucks involved in the accident

The incident location is also known as a black spot location because several accidents have also occurred around the location. Based on this data, it can be seen that there is:

Front – Front Accident	: 8
Back – Front Accident	: 2
Single Accident	: 1
Accident with Pedestrian Casualties	: 1

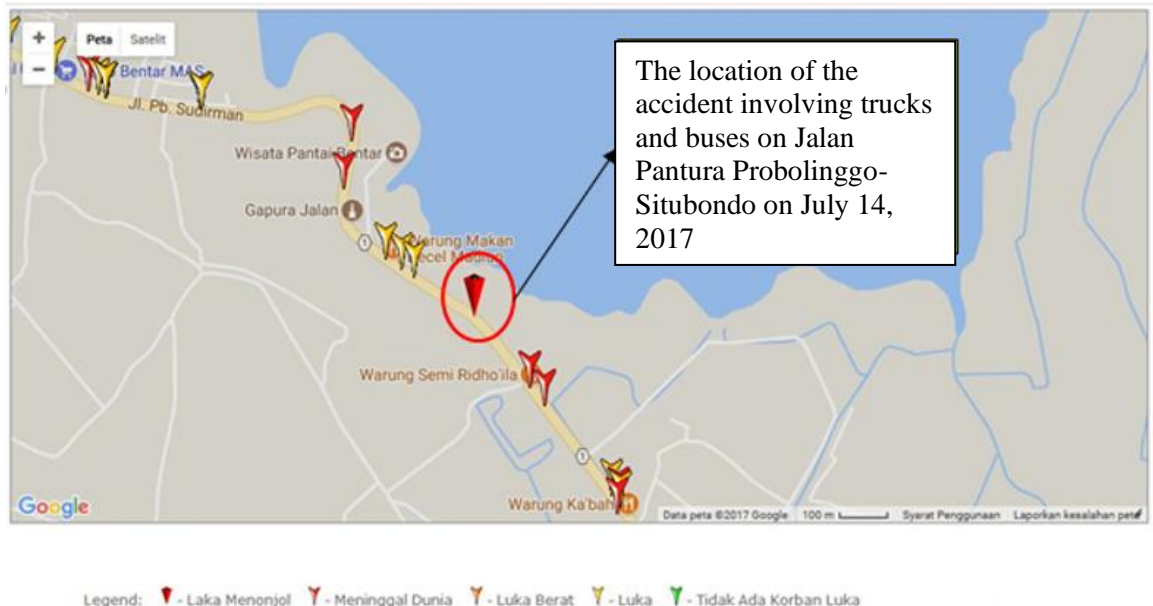


Figure 2. Accident data according to IRSMS at the location of the incident

Existing Road Condition

Jalan Pantura Gending Probolinggo-Situbondo is a national road with type 2 / 2UD (two undivided two-way lanes) and a primary arterial road function. The pavement construction is flexible pavement with a width of 7 meters for two directions with a shoulder of 1 meter on both sides not paved. Based on the National Transportation Safety Committee (NTSC) report, the road surface conditions were in poor condition at the accident. The road surface has many holes, uneven, and patches.



Figure 3. The condition of the pavement at the location of the incident

The horizontal alignment conditions at the incident location are several bends with small to large radii and several straight roads. Figure 4 shows the orientation of the horizontal alignment of the scene.

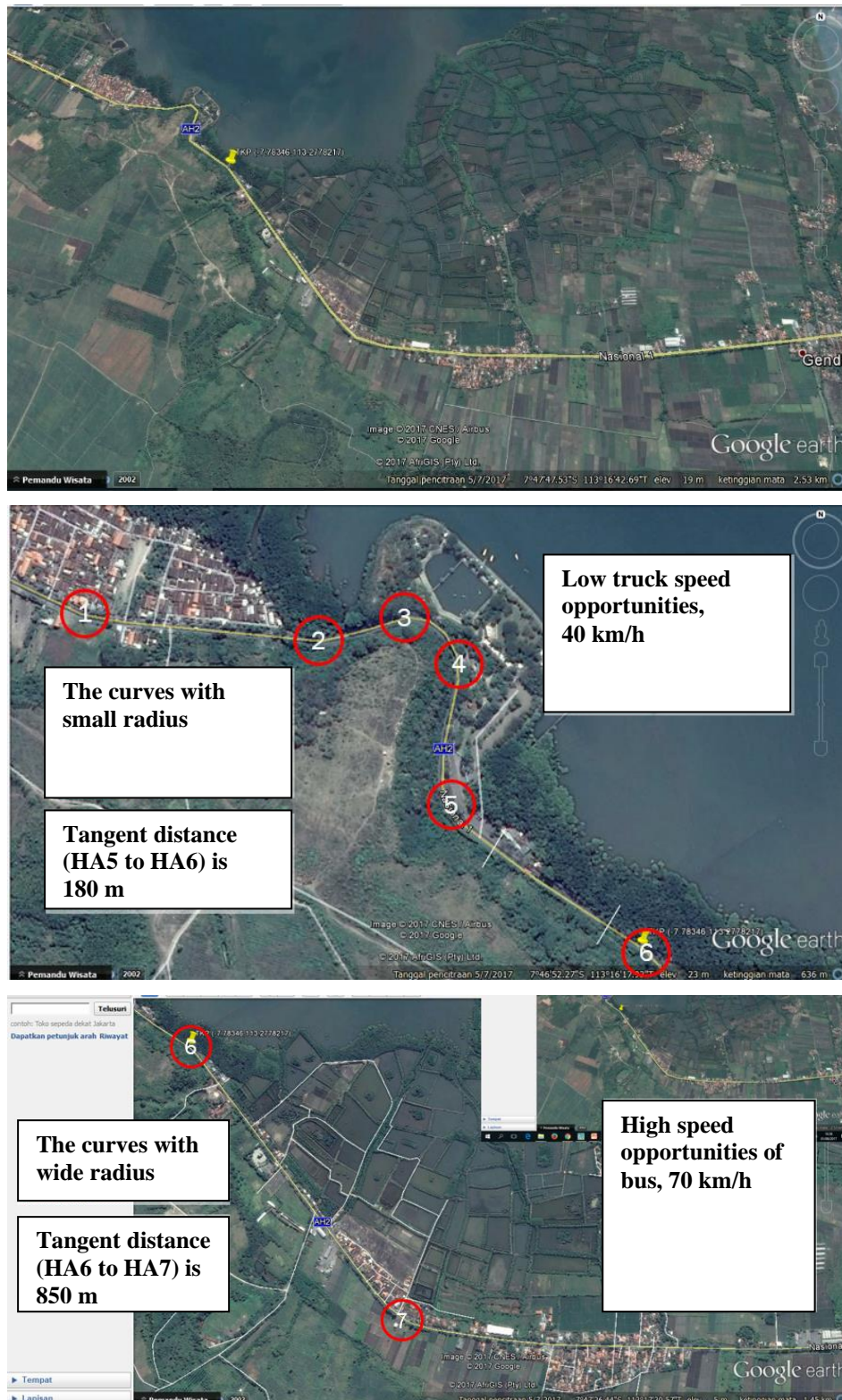


Figure 4. Orientation of the horizontal alignment at the scene

The horizontal alignment orientation shows that from the direction of Probolinggo, the truck is passing several turns with a small radius (R), so it is likely that the truck will speed slowly. However, from the direction of Situbondo, the road conditions are straight, and there is only one bend with a large R which causes the possibility of the bus driving at high speed at the scene of the incident.

Meanwhile, in terms of signage, there is a warning sign for a bend to the right ± 137 meters before the accident site from Situbondo to Probolinggo (Figure 3). The warning signs are visible. There is a warning sign for a bend to the left ± 109 meters before the accident location from Probolinggo to Situbondo (Figure 3). The warning signs are visible. There is a warning sign for a bend to the left ± 50 meters before the accident location from Probolinggo to Situbondo (Figure 3). A thick tree covered the warning sign. There is a middle mark, and the side of the road is white. However, some of the conditions are already blurry. At the location of the accident, the markers were lost due to the overlay process. There are also side markers missing. There is also a warning light about 112 meters before the accident scene from Situbondo to Probolinggo. However, the warning light did not work. This warning light provides a warning in both directions, both vehicles heading to Probolinggo and vehicles heading to Situbondo.



(a) Sign for a right bend from the direction of Probolinggo



(b) Sign for a left bend from the direction of Situbondo



(c) Warning signs before location



(d) Public Street Lighting at the location

Figure 5. The condition of road facilities around the location

Truck Dimension Factor

Government Regulation (PP) Number 55, year 2012 about “Kendaraan” (Vehicle), certifies that the length of the motor vehicle is not more than 12,000 mm for a vehicle without a trailer or trailer other than a bus, not more than 13 500 mm for a single bus, and not more than 18

000 mm for a motor vehicle equipped with a trailer or patch. The width does not exceed 2,500 mm; the height does not exceed 4,200 mm or does not exceed 1.7 times the width. Whereas the front overhand does not exceed 47.50% of the axis distance, the effective rear overhang does not exceed 62.50% of the axis distance, and the angle goes at least 8 degrees from the surface of the plane/road surface.

Meanwhile, the measurement results for the axle distance of the truck are 5,530 mm. Thus, it was found that there was a shift in the rear axis position by 930 mm. This is incompatible with PP No. 55 year 2012 about “Kendaraan” Article 54. Rear Over Hang (ROH) measurement shows that the truck has an ROH of 3,600 mm. Thus, the truck’s ROH has exceeded 62.5% of the distance between the axles (maximum 2,875 mm). This is incompatible with PP No. 55 year 2012 about “Kendaraan” Article 54. In the truck tub measurement, it was found that the width dimensions of the tub exceeded the provisions, namely 2,870 mm. Meanwhile, the rules of PP No. 55 year 2012 about “Kendaraan” article 54, the maximum width of the vehicle is only allowed to be 2,500 mm. This is exacerbated by the fact that the truck’s payload is 25 tonnes (over the load limit of 18 tonnes).

Changes in vehicle dimensions will certainly be a hazard. When the vehicle crosses the corner, the width of the vehicle will increase. Vehicles that are over-dimensioned will endanger other vehicles. The distance between the axles that are not being extended according to the rules will also increase the vehicle’s turning radius so that the required vehicle prow will also be even greater. In terms of vehicle stability, changes in dimensions will also affect the vehicle’s centre of gravity. The body of the vehicle that is extended can certainly be dangerous if the vehicle crosses a corner.

In this major accident, the back of the truck got into the bus. When cornering, part of the truck body passes through the road axle markings. The dynamics of the vehicle when turning causes changes in the width of the vehicle in the corner.

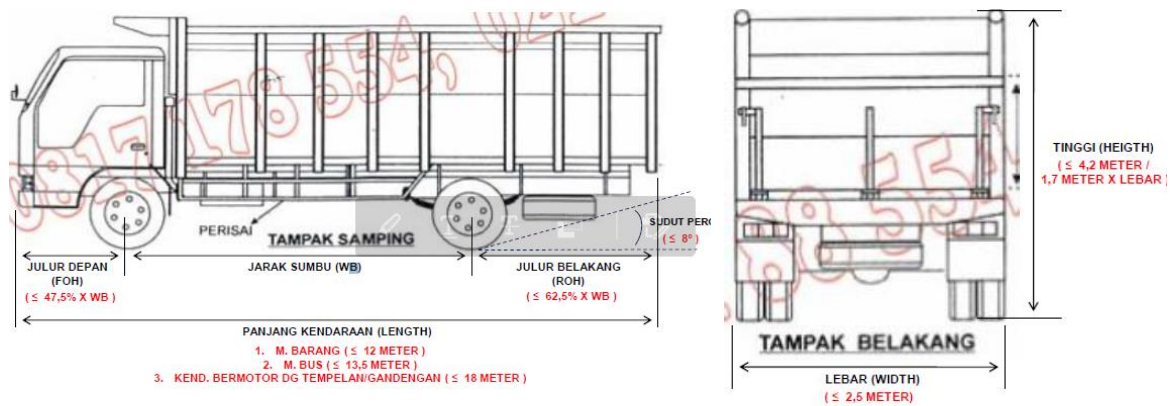


Figure 6. Vehicle Dimension Based on PP No. 55 year 2012 about “Kendaraan”

Bus Speed and Condition Factors

Field investigations show that the bus' last gear transmission is in 6th gear. 6th gear indicates the high speed in the range 80-100 km/hour. This is also supported by the fact that the horizontal alignment tends to be straight before the scene. This speed can still be tolerated on primary arterial roads if supported by good driver conditions and good reaction times. However, high speed causes the greater centrifugal force on the vehicle when it passes

through a bend. The results of the field investigation show that 0.6 meters of the bus passed the as road.

In terms of the bus's condition, the bus body is reconditioned with an iron plate with corrosion. At the time of the incident, the driver's cabin's iron plate was badly damaged when it collided with the truck's body.

Geometric Factors, Surfaces, and Road Infrastructures

The condition of the road's cross-section (superelevation), which is only 3%, is one of the hazards. This is because superelevation is useful for reducing the amount of centrifugal force that occurs in the corner. If the superelevation is not up to standard, the vehicle will be thrown out of the track. Potential hazards also come from road pavement conditions. The pavement at the location of the incident is uneven, bumpy, and has many patches. The uneven and bumpy road conditions on the side of the road also cause the potential for vehicles to drive more in the middle. The road markings that are blurry and some have been lost also cause hazards because there is no clear curb.

There are no accident-prone warning signs in terms of road equipment, 500 meters before the location of the incident. This absence can create hazards due to the driver's lack of attention if they enter an accident-prone location. Besides, many PJUs around the location is also covered with trees. The warning light at the scene also does not work.

Human Factors and Driving Time

The results of the investigation stated that the bus driver's total driving time was 8 hours. However, there are conditions where the break time every 4 hours of travel is not fulfilled. This condition indicates that the driver is in a fatigued condition. Furthermore, the vehicle is driven at night in the human sleep cycle. This is a potential hazard because drivers can experience micro-sleep. Fatigue conditions can lead to reduced human reaction time in driving. The risk is magnified by the fact that the vehicle speed is high at the scene.

Recommendation

In this case, the speed limit is important, considering the location where the accident occurs is an accident-prone area. This is evidenced by the statistical figures of accidents that occur in the area. Thus, it is necessary to provide safe speed limit signs following the conditions and class of the road at the accident location.

Superelevation improvements need to be done, from the initial 3% to 5%, according to a bend radius of 383 meters. In addition, it is necessary to level the road surface and give the markings firmness. Several recommendations regarding road equipment include:

1. Repair of the guard rail on the left side of the road from west to east, because the condition is not good;
2. Cutting branches and branches of trees that obstruct visibility and traffic signs;
3. Removal of boulders by the side of the road and other material that is a potential hazard;
4. Installation of accident-prone warning signs;
5. Installation of signs prohibiting overtaking of other vehicles;
6. Painting the road markings and adding two solid line double markings to the curves;
7. Installation of a delineator (Chevron) at the corner;
8. Installation of road studs with a metal deflector;

9. Use of tactile tape on the outer side markings of the road body;
10. Use of materials that are easily crushed if hit, compared to rigid materials such as concrete and steel for guideposts; for example, by using PVC pipe or can use hard rubber;
11. Installation of the road dividing stakes, paying attention to the concrete below ground level, not above ground level.

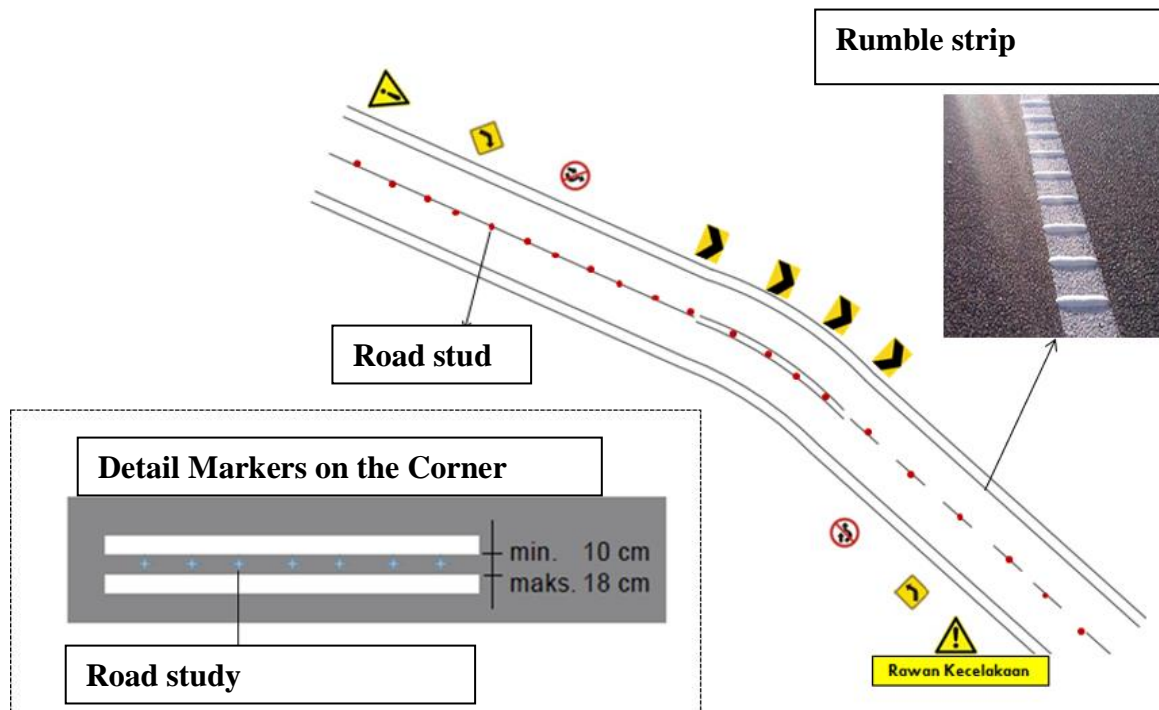


Figure 7. Recommended signs and markers at the scene of the incident

In terms of the truck's dimensions, if there is a plan from the vehicle owner that will change/modify the cargo body, the planning of the change must not violate Article 54 and 55 PP 55 the year 2012. In addition, changes in design that are made must also meet the vehicle's technical and roadworthiness requirements. Thus, changes in load through width, material, and reinforcing structure carried out by the car body must comply with the conditions stated in Article 54 and 55. There is a need for strict enforcement against welding workshops that do not have a business license so that the welding workshop makes or modifies cargo tanks haphazardly.

CONCLUSION

A major accident occurred between a bus and a truck on Jalan Pantura Probolinggo-Situbondo. As a result, there was a fatal accident, ten people died instantly at the scene, and 9 others suffered minor injuries. Some of the factors that become hazardous in accidents are prominent factors of truck dimensions, bus speed, geometric conditions and road equipment, as well as human factors and driving time. The dimensions of the ROH, the shift of the rear axle, and the truck's dimensions violate PP No. 55 the year 2012 about "Kendaraan" Article 54. This is exacerbated by the fact that the truck's payload is 25 tonnes (over the load limit

of 18 tonnes). Field investigations show that the bus' last gear transmission is in 6th gear. 6th gear indicates the high speed in the range 80-100 km/hour. This is also supported by the fact that the horizontal alignment tends to be straight before the scene. In terms of the bus's condition, the bus body is reconditioned with an iron plate with corrosion. The road's cross-section (superelevation) condition, which is only 3%, is one of the hazards. The results of the investigation stated that the bus driver's total driving time was 8 hours. However, there are conditions where the break time every 4 hours of travel is not fulfilled. Recommendations that can be given are in the form of geometric road improvements and road equipment.

REFERENCES

- Goniewicz, K. *et al.* (2016) 'Road accident rates: strategies and programmes for improving road traffic safety, *European Journal of Trauma and Emergency Surgery*, 42(4), pp. 433–438. DOI: 10.1007/s00068-015-0544-6.
- Sugiyanto, G. (2010) 'Biaya Kecelakaan Lalulintas Jalan di Indonesia dan Vietnam', *Jurnal Transportasi*, 10(2), pp. 135–148.
- Zanuardi, A. and Suprayitno, H. (2018) 'Analisa Karakteristik Kecelakaan Lalu Lintas di Jalan Ahmad Yani Surabaya melalui Pendekatan Knowledge Discovery in Database', *Jurnal Manajemen Aset Infrastruktur & Fasilitas*, 2(1), pp. 45–55.