Journal of Artificial Intelligence and Engineering Applications

Website: https://ioinformatic.org/

15th June 2025. Vol. 4. No. 3; e-ISSN: 2808-4519

The Lack of Safety Facilities on Pintu Angin Biak Road Results in Less Users Negating Driving Safety

Mega Sintya Ose Attawuwur[1], Riza Phalevi Marwanto[2], Suprapto Hadi[3*]

[1,2,3]*Polytechnic of road transportation safety*
hadi@pktj.ac.id[3]*

Abstract

The purpose of this study is to identify the risk of road accidents in order to provide solutions or recommendations in improving road safety facilities as a preventive measure with the PKJI (Indonesian Road Safety Guidelines) method on Pintu Angin road, Biak Regency. Jalan Pintu Angin is an arterial road that connects the Provincial Road (Biak-Adibai-Marauw Section) and the National Section (Biak-Moker), the Provincial Section (Biak-Bosnik). However, this is not balanced by the complete safety facilities, especially street lighting, markings, reflectors, and traffic signs. The road has several danger points, including uphill and curved roads, besides that there is also no availability of warning signs and road monitoring ahead which makes this Japanese Cave road often an accident-prone point. This accident risk analysis obtained results, which showed that these hazards have varying levels of risk ranging from moderate to extreme. This can be urgent to fulfill the need for warning signs in areas with a high risk of accidents, as well as the installation of guardill repairs, lighting lights, reflectors, and markings. The implementation of appropriate risk control measures is expected to reduce the risk of accidents, and the severity of accidents, and it is expected to increase safety and welfare for road users in this area.

Keywords: *Road safety, Safety facilities, PKJI, Planning standards*

1. Introduction

As Transportation is the main factor in life, where there are more and more needs of a person, so that in meeting these needs, continuous and repetitive mobility is needed. But behind that, the demographic condition of the region greatly affects transportation in the region[1]. The factor that greatly affects the ability of transportation to meet the needs of the community is the increase in the number of population, both caused by the birth rate and the flow of urbanization [2]. At this time, road transportation safety is a global problem, due to the increasing number of traffic accidents every year. Many efforts have been made to minimize accidents to road users. However, this is not that simple, because there are three main elements in the highway transportation system, namely people, transportation facilities and infrastructure[3].

Accidents that often occur are caused by several factors, one of which is inadequate safety facilities, for example, the lack of facilities on a road and even geometric conditions that are not in good condition[4]. Based on data from the Biak Numfor Regency Police, in 2023 there were 67 incidents with a total loss of 16 million rupiah and 25 people died. One of the reasons is due to the inadequate availability of road facilities, in addition to the lack of knowledge or understanding and public attention to traffic safety [5].
According to the regulation of Law Number 22 of 2009 concerning LLAJ, road users have the right to the availability of safety facilities in the form of cavedrills, street lighting, signs, and road markings [6]. One of the districts located in Papua Province is Biak Numfor. This regency consists of two small islands, namely Biak Island and Numfor Island [7]. Including the Padaido archipelago which is the primadonna, it is the destination of tourists to come to Biak Island [8]. This condition affects the mobility of tourism potential transportation, so it is necessary to have safe safety facilities to minimize accidents or vehicle conflicts. The Wind Gate Road in Biak City connects the Provincial Road (Biak-Adibai-Marauw Section) and the National Road (Biak-Moker), the Provincial Road (Biak-Bosnik) [9]. However, this is not balanced by the complete road safety facilities, especially guadrills, street lighting, and signs. Following up on this, in providing safety and comfort for road users, this location needs to be reviewed in order to provide solutions to improve or improve service facilities for road users [4] . The achievements to be aimed at include being able to find out geometric conditions, safety facility conditions and provide solutions in reducing the number of accidents or reducing the number of crimes on the road.

2. Research Methodology

Research Location

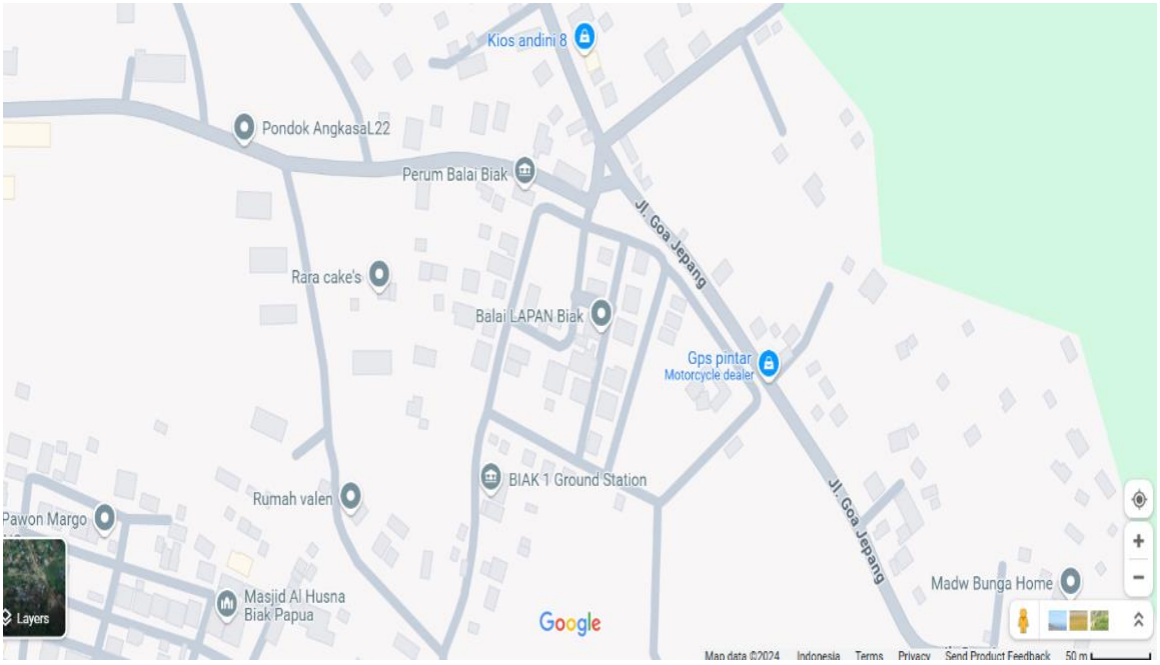

Fig. 1: Map of Pintu Angin Road – Japan Cave (Google Maps)

The survey was carried out on Jalan Pintu Angin – Goa Japan (Figure 1), the road is an arterial road with 2 directions 2 lanes without a median (2/2 TT). The road has a length of 2,405 meters with a total lane width of 6 meters, where each lane is 3 meters wide. The slope of this road is recorded at 5% and the bend radius is quite large (>50), and it does not have a shoulder because it is directly faced with the left side of the cliff and the right side of the ravine. In addition, this road section is not equipped with lighting lights, warning signs and reflectors, reflectors and road surfaces using flexible pavement or asphalt.

Data Collection Techniques
Surveys were conducted in the field directly to obtain primary data and secondary data was obtained from Laka Lantas. The following is the data in the study:
a. Primary data collection in the form of road geometry includes length, width, type, pavement, shoulders, signs and road markings. This data is expected to be able to present and find out the condition of the nayata on the road.

b. Secondary data collection is in the form of data from the Biak Regency Police regarding traffic accident data for the last 5 years (2019 – 2023) that occurred on the road.

PKJI Method (Indonesian Road Study Guidelines) .
The PKJI method is a technical guidance document used to analyze, plan or evaluate the capacity and level of service on roads in Indonesia. PKJI provides methods and formulas to assess the performance of various types of road facilities, including urban roads, arterial roads, local roads and intersections, both signaled and unsignaled.

Based on the PKJI guidelines that have been conveyed, the following are the ideal values of the deviation of the lane width and lane width.

Tipe jalan	Lebar lajur atau jalur efektif (L_{LE} atau L_{JE}), m		FC_L
4/2-T	Per lajur	3,00	0,91
&		3,25	0,96
6/2-T		3,50	1,00
		3,75	1,03
2/2-TT	Total dua arah	5,00	0,69
		6,00	0,91
		(n.d.)7,00	1,00
		8,00	1,08
		9,00	1,15
		10,0	1,21
		11,0	1,27

Tabel 1. Faktor koreksi kapasitas akibat perbedaan lebar lajur, FC_L
(Direktorat Jenderal Bina Marga et al., n.d.)

Planning standards
The purpose of the road construction plan designed must be in accordance with the standards. This aims to reduce the incidence of accidents and minimize the consequences of accidents that occur. The consequences in question include the accident rate, the number of victims, and

the fatality rate. Therefore, any handling efforts must focus on that goal. Traffic accidents on certain roads are often caused by non-compliance with road technical provisions or requirements, such as road facilities and alignment. After these planning standards and technical provisions are met, handling steps are taken to reduce the risk of accidents and their impacts[10].

In essence, road infrastructure with road equipment facilities that are fulfilled has several handling, including:

1. **Management of road bodies**

including improving the geometric condition of the road, building medians, improving road alignments and gradients, and other works carried out on the road body.

2. **Roadside management**

This includes the improvement and widening of shoulders, the construction of sidewalks, the placement of kerbs, the management of road access, the construction of soil retaining structures, and other works related to the boundaries of the road body.

3. **Management of road support infrastructure**

Including the placement of traffic signs, lines on the road, public street lighting (PJU), traffic flow control lights, kilometer markers, guide posts, road safety, planting protective trees, and other facilities that can support the completeness of the road.

Road Failability Planning Standards
Based on Pd T-15-2005-B: Technical guidelines on the installation of traffic signs on roads. This document is a guideline in planning, installing, and managing traffic signs to comply with safety standards and road functions. This aims to provide technical guidelines for the installation of traffic signs in accordance with the function of the road and ensure the existence and effectiveness of signs in supporting the safety of road users.

Traffic Signs Technical Standards
Sign Size:
- Adapted to the type of road (arterial, collector, local, or toll road).
- Larger size for signs on toll roads or arterial roads at high speeds.

Material:
- Aluminum or galvanized steel.
- Reflective materials (such as scotchlite) for night visibility.

Inscriptions and Symbols:
- Uses easy-to-read international standard (ISO) letters and symbols.
- High contrast between the writing and the background.

Color:
- Follow the standard guidelines for each type of sign (e.g., yellow for warnings, blue for commands, green for directions).

Installation Location and Layout
Mounting Distance:
- Adjusted to the speed of the vehicle.
- Additional signs that provide information regarding the distance to the critical location, as stipulated in Article 8 letter j, include: a. warning signs indicating that the critical location is 450 (four hundred and fifty) meters from the position of the sign; b. warning signs indicating that the critical location is 300 (three hundred) meters from the position of the sign; danc. warning signs indicating that the critical location is 150 (one hundred and fifty) meters from the position of the sign[11].

Mounting Height:
- At least 1.5–2.5 meters from the road surface.
- Adjusted to the needs so as not to interfere with visibility.

Installation Direction:
- Facing the direction of the vehicle.
- Not obstructed by trees, buildings, or other objects.

3. Result and Discussion

Pintu Angin road – Goa Japan
This road section has a length of approximately 2,405 Km, which connects several tourist attractions in Biak Regency. This road section is an alternative road section to connect national roads, as well as provincial roads. This road section is not only a tourist link but also an alternative road that can be passed by the community to travel from village to city or even vice versa. But in reality, this road section is not equipped with adequate facilities

Figure 3. (a) this road has the potential for conflict (Hazard)

Figure 3 (b). The road is not equipped with signs, markings, and street lighting

Figure 3 (c). Turning ramps and blindspots

The condition of the road is uphill and turns with the geometry of the road that is not in accordance with the standard where the slope is quite high and the bend radius is large enough (>50). Then it is not supported by incomplete signs and markings added with hazards so that the vehicle has difficulty seeing the vehicle from the opposite direction. that does not exist so that the road is considered unsafe.
In the picture, it is shown that the road does not have markings, and the conditions for installation are, the white road markings mentioned in paragraph (1) letter a indicate that road users must comply with orders or prohibitions in accordance with the form of the markings[12].

The road is not equipped with public street lighting. Therefore, the following is a guide for the placement and installation of street lighting equipment as stipulated in Article 6 paragraph (1) letter b, which is carried out on:
a. Road network, including:

1. Freeways;
2. Arterial roads;
3. Collector's road;
4. Local roads; and
5. Freeway.

Placement of convex glass serves as an enhancer This convex glass is usually installed on the side of the road in areas where the visibility of motor vehicle drivers is very limited, especially in sharp corners or intersections (Director General Contact Darat, 2011).

Analysis of Ideal Value Factors of Lanes and Lanes on the Road
The determination of accident-prone areas in Biak Regency is the result of data from the Biak Numfor Regency Police from 2019 to 2023. One of the accident-prone areas is the Pintu Angin – Goa Japan road.

Table 2: Traffic accident data on the Pintu Angin – Goa Japan road

YEAR	LAKA	MD	LB	LR
2019	50	10	20	20
2020	23	7	10	6
2021	33	12	5	16
2022	41	15	9	17

2023	67	25	17	25

Source [13]

Based on this data, the most fatal accident occurred in 2023 with a total of 67 victims, consisting of 25 deaths, 17 serious injuries, and 25 minor injuries. Based on the information obtained, this accident was caused by a lack of street lighting and poor visibility, making it difficult for road users to see vehicles from the opposite direction.

Analysis based on Types of accidents that occur on Pintu Angin Road – Goa Japan

Table 3: Data on traffic accident types on the Pintu Angin – Goa road section in Japan

No.	Types of accidents	2019	2020	2021	2022	2023	Total
1.	Front collision	20	12	14	19	25	90
2.	Side Collision	6	4	7	10	17	44
3.	Rear collision	12	5	9	10	19	55
4.	Hit-and-run	4	1	0	2	6	13
5.	Pedestrian collision	4	1	3	0	0	8
	Total	50	23	33	41	67	214

Source [13]

After an analysis of accident incidents in Biak Regency, it can be concluded that the highest accidents occurred in 2023 with 67 accidents

4. Conclusion

Based on the above problems, it can be concluded that the Pintu Angin Road section that is not equipped with safety facilities, such as traffic signs in the form of warning signs, road lines as lane separators, and adequate street lighting, can increase the potential for traffic accidents. Without road markings, it is difficult for motorists to know the exact lane and lane boundaries, which can lead to confusion in setting the position of the vehicle. Loss of illumination at night reduces visibility, which makes it more difficult for motorists to see road conditions as well as other vehicles. This lack of safety facilities can increase the potential for accidents, especially in congested or high-risk areas. Therefore, improving road safety facilities, such as the addition of road markings, the installation of clear traffic signs, and the provision of adequate lighting, is very necessary. This step aims to improve the safety of road users, reduce the number of accidents, and provide comfort in driving.

So in this case, recommendations are needed to reduce potential dangers on the road.
Recommendations related to road safety include:

1. Placement of traffic signs in the form of warning signs going down the mountain or going up an uphill. The installation of signs as in the picture above provides a warning for drivers about changes in road conditions. The placement of warning signs is placed 250 meters before the critical location.
2. Street lighting.
   The installation of street lighting is very functional for motorists to be able to see the road properly, in addition, it can reduce the incidence of accidents and to prevent crimes, such as begal and other crimes.
   The placement and installation of street lighting lights is carried out on:b. Road network, which includes:1. Toll Road;2. Main road (artery);3. Connecting roads (collectors);4. Local roads; and5. Roads in residential areas (neighborhoods).
   At this location, the installation and placement of street lighting lights is about 45 meters away, with a pole height of 7 meters, and a lighting level of 10 – 20 lux.
3. The installation of the reflector on the guadrill serves as a light reflector
   The installation of reflectors on the guardill functions as a tool to reflect light rays on the vehicle, so that drivers can be more careful.
4. Installation of convex glass so that the driver can see the vehicle from the opposite direction.
   This convex glass is very functional to be installed on turning roads, as well as on roads that are prone to accidents, so that vehicles from the front can see other vehicles from the opposite direction. The installation and placement of this convex glass is placed on the side of the road.
5. Road Markings
   Road markings function as lane separators on the road so that vehicles in the opposite direction do not pass through other users' lanes. White road markings indicate that road users must comply with the orders or prohibitions set according to the form of the markings.

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