



TRANSPORTATION IN BALI: TRANSPORTATION OPTIONS

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ABSTRACT

Obtaining comfort and safety in a vehicle is very difficult, because it depends on the condition of the vehicle and the nature and character of the driver in general. Vehicles must be fit for use so as not to cause accidents. It is proven that accidents increase every year due to the increase in existing vehicles. Riders must undergo a psychiatric test if riding public transport with passengers. It would be better if a breakthrough was made by creating parking pockets in designated areas. What is clear from this breakthrough is the possibility of

creating a railway line, but trains have always been rejected by the Balinese Hindu community because they believe that they should not walk under people on the road. When driving a vehicle on the highway, you should be in top physical and mental condition so you can operate the vehicle well until you reach your destination.

KEYWORDS: Physical, mental, vehicle, human, ergonomics.

INTRODUCTION

Transportation is the most important means for personal and family needs. The need for transportation is a daily need for both individual needs and the needs of many people. Every day everyone needs this transportation for needs near or far according to their needs. A family can have at least one motorbike for travel purposes or perhaps for work. Many people work in the city of Denpasar, Badung to earn a living from smaller cities to big cities from the city of Karangasem to the city of Denpasar, Badung and transportation requires at least a motorbike. The development of roads for transportation is the problem. Currently it is very difficult to get land to make roads for transportation.

As time passes, there are more and more vehicles, while the roads are still fixed, and the number of lanes will not necessarily increase every year to reduce congestion. Apart from that, it is very necessary to provide training to motorbike drivers so that the vehicle can speed well without disturbing other riders and four-wheeled vehicles are also given training and mental tests.^[15] Ergonomically, this kind of thing must be followed up immediately to reduce accidents resulting in traffic jams.^[4] The increasing volume of vehicles, both two-wheeled and four-wheeled, contributes to accidents and will require roads with good lanes and good quality. The most difficult obstacle for road procurement is land provision, because land in Bali is very expensive per m². transportation is to add to existing transportation roads. It is very necessary to add roads for transportation to ensure smooth roads and reduce traffic on the roads.^[6] But at least make a change in the form of transportation to a larger form of mass transportation, namely in the form of providing trains with special routes.^[5] Trains make it possible to use them on routes that are most likely to be used by people for work.

Railway lines make it possible to reduce traffic congestion and should be routed on busy routes to create temporary stops and stations in unobtrusive places. What is clear is that Bali must work on transportation as a whole, it must be based on safe and comfortable ergonomics.^[1]

LITERATURE REVIEW

Transportation is the main means of getting to a work or business destination which is always used as a milestone in the lives of most people looking for work. Apart from that, roads that are used for transportation are mostly used by people to come and go for a certain purpose.^[23]

Transportation is very important for people who need a smooth business because the smooth running of a business or enterprise all depends on the existing transportation network. Transportation roads must be suitable for use for the business being created so that the capabilities of those who need something are smoother.^[21]

Transportation roads really require awareness from the owners of the surrounding land of the land used as the road because when maintaining the road, it is between village entrances.^[10] If the road belongs to the state, the road will definitely be maintained by the state in accordance with existing laws and the rules will be adjusted by the state.^[7] The road used is adjusted to the weight of the vehicle or the heavy tonnage of the vehicle crossing the road being traversed.^[2] Each vehicle has strict rules that pass through the road and the possible height of the transport that will pass. Restrictions on transportation on certain roads are intended to make transportation roads more durable because it is seen from the quality of the roads being

made.^[3] Ergonomics teaches us to drive with the philosophy of going safe and coming home safe.^[20]

MATERIAL AND METHODS

Material

Vehicles will be very necessary at this time for daily activities related to life. Every day, two-wheeled vehicles are a mainstay for mothers to go to the market and for other purposes that are not too far away. For long distances, a rental vehicle or private vehicle is required. But currently two-wheeled vehicles are used over quite long distances, namely between cities. Sometimes someone will go home on Saturday and return on Sunday. This is the problem that many people don't have a four-wheeled vehicle for.

Method

The method used to solve this problem is by conducting interviews, searching for data on the internet and analyzing it to get answers. The results of the answers are used to find out how useful a vehicle is for a particular area and the roads needed to meet other vehicles to determine whether other transportation is needed, such as providing train transportation.

RESULTS AND DISCUSSION

Results

Table 1: Motorbike data for each district.

Regency/City	Number of Motorbikes According to Regency/City in Bali Province (Unit)		
	2020	2021	2022
Karangasem Regency	197,148	201,486	241,259
Tabanan Regency	381,547	387,740	403,076
Badung Regency	780,630	793,885	831,501
Gianyar Regency	410,553	416,902	459,933
Klungkung Regency	123,979	126,236	162,346
Bangli Regency	108,383	110,761	118,476
Karangasem Regency	187,976	192,256	206,877
Buleleng Regency	421,426	429,917	450,766
Denpasar Regency	1,200,315	1,218,412	1 205,383
Bali province	3,811,957	3,877,595	4,079,617

Table 2: Vehicles by Type.

Transportation type	Number of Vehicles by Type in Bali Province (Units)		
	2020	2021	2022
Bus	9,205	8,911	11,257
Truck	156,624	159,003	171,603

Motorcycle	3,811,957	3,877,595	4,079,617
Passenger car	460,909	465,282	493,887
Amount	4,438,695	4,510,791	4,756,364

Table 3: Number of two-wheeled vehicles in each district.

Regency	2020	2021	2022
Buleleng Regency	421,426	429,917	450,766
Denpasar City	1,200,315	1,218,412	1,205,383
Bali province	3,811,957	3,877,595	4,079,617

Table 4: Length of roads in each district.

Regency/City	Road Status			Total
	State Roads	Provincia l Roads	Regency/City Roads	
<i>Regency/ Municipality</i>	<i>National Roads</i>	<i>Provincia l Roads</i>	<i>Regency/ Municipality Roads</i>	<i>Total</i>
Jembrana	49.88	44.63	486.08	580.59
Tabanan	63.61	60.58	683.74	807.93
Badung	65.73	135.68	863.22	1,064.63
Gianyar	64.33	86.54	515.24	666.11
Klungkung	37.71	9.34	453.80	500.85
Bangli	21.19	125.45	905.81	1,052.45
Karangasem	97.97	146.33	1,202.54	1,446.84
Buleleng	156.34	104.27	1,136.60	1,397.21
Denpasar	72.63	30.52	1,075.93	1,179.08
Total:	62,939	743.34	7,322.97	8,695.70

Table 5: Number of traffic accidents in Bali Province before ergonomic improvements were carried out.

Traffic Accidents	Number of Traffic Accidents in Bali Province		
	2020	2021	2022
Incident	1,787	1,984	3,620
Die	405	318	502
Serious Injuries	55	56	59
Minor injuries	2,560	2,851	5,083

Table 6: Number of Traffic Accidents in Bali Province After Ergonomic Improvements.

Traffic Accidents	Number of Traffic Accidents in Bali Province			
	2020	2021	2022	2023
Incident	158	94	54	43
Die	97	50	25	22
Serious Injuries	36	27	14	11
Minor injuries	25	17	15	10

Table 7: Percentage of Traffic Accidents in Bali Province After Ergonomic Improvements.

Traffic Accidents	Changes in Accidents After Ergonomic Improvements
	2023
Incident	0.80 (80%)
Die	0.88 (88%)
Serious Injuries	0.79 (79%)
Minor injuries	0.67 (67%)

Table 8: Comparison of lamp watts and lumens.

Lumen to Watt Conversion Chart			
Lumens	Incandescent Watts	Halogen Watts	LED Wattage
100	7	6	2
375	25	20	4
450	30	25	5
800	60	45	9
1100	75	60	12
1600	100	90	17
2600	150	145	27
3000	200	175	32

DATA DESCRIPTION

Looking at existing data, the number of motorbikes and other vehicles will continue to increase every year. Therefore, it is necessary to add additional road sections for transportation and currently these roads start to get very busy in the morning when people start their activities to work somewhere. Seeing that the average increase in the number of motorbikes each year is around five percent in 2021 to 2022, this will continue to happen in the following year.

If road construction is not immediately anticipated, traffic jams will occur every day. The addition of two-wheeled vehicles is very rapid because school children need them at the end of every year. The second is the need for passenger cars for business reasons. These cars are used to find passengers to support the family.^[9] Vehicles can be used for business, such as two-wheeled vehicles which are currently used to look for passengers to take passengers to other places using the terms Gojek and Grab to deliver orders online. More and more people have to support themselves and their families and have to have future savings for their next life. The ratio of road length to the total number of vehicles is only 0.2 percent of all existing vehicles. If all vehicles run at the same time, the road will become congested because there are so many vehicles and it will take several hours to wait on the road until the vehicles arrive at their destination and go to their respective destinations. The government has provided buses to take

passengers to their destination, but they are still not functioning properly and at certain times the cars are still empty. And the Government's decision is also disadvantaged by the presence of large and long buses which, if the road only has two or three lanes, will be difficult, especially with trucks carrying river stones or sand, because the roads and lanes are still narrow. To make it safer and more comfortable on the road, it is very necessary to provide a road that is slightly wider to accommodate three cars or reduce the number of vehicles or perhaps schedule the road as a whole. It is very necessary to carry out mental tests of vehicle drivers carried out by bus owners or companies to determine the mental level of four-wheeled vehicle drivers.^[11,14] The method used to determine the level of safety of the vehicle and driver must later be used as a benchmark in driving because the bus will carry many passengers.^[14,15] Almost all motor vehicle accidents are caused by human factors, so drivers must be physically, mentally and physically healthy. The many models of motorized vehicles, both in shape and physical condition, will create various types of vehicles that are attractive and in demand by the market. And finally, knowledge and understanding of traffic signs must also be possessed.^[18]

Street lights also greatly influence the comfortable speed of vehicles at night when traveling.^[19] The street lights use 12 watt LED lights with a lumenance of around 1100 lumens with an installed height of around 9 meters. The installed street lights are capable of illuminating 10 meters ahead and to the side. Installation of lights in a row with a distance of 25 meters between roads according to the length of the road being illuminated. Apart from the lights on the car, street lights also have a big influence on the driver's eyes because the two lights have different functions. Street lights function to illuminate the road around the location where the lights are installed and as road directions. The function of car lights is to provide lighting or help clarify the direction being traveled.^[2]

The ergonomic changes (Table 5., Table 6.) that have been made are that first, motorbikes must have headlights on, secondly, wear a helmet if you want to ride a two-wheeled vehicle on the road, thirdly, carry documents and speed vehicles must be limited.

If the distance traveled is long, try to find a place that can be used as a place to rest. On the highway, there may be people who create rest areas while selling snacks, making drivers feel tired and need to rest to relieve fatigue and thirst. This resting place was created as a place for trade and also for short entertainment.^[22]

CONFLICT OF INTEREST

This is where the problem lies, many people are victims of the policies of interests who want them and are always different from the decisions taken by their superiors. This decision is always used by the community to carry out activities that are government decisions.^[16] The number of two-wheeled and four-wheeled vehicles must be reduced according to needs and the number of people leaving the house during rush hours. Meanwhile, four-wheeled vehicles can be used to transport private passengers, public passengers and goods which may have to be separated according to the scheduled departure time. Departure, speed and schedule arrangements must be made to reduce the problem of road accidents. Judging from the accident table from 2020 to 2021, there is a change in accidents of 0.11 (11%), and accidents in 2022 experienced a very large change, namely 0.82 (82%). A very large increase in accidents in 2022, causing many fatalities, requires solutions to reduce accidents so as to reduce fatalities. Looking at current conditions, two-wheeled and four-wheeled drivers must have a fairly high level of comfort by designing a comfortable vehicle and a four-wheeled driver's seat by providing a comfortable seat so that the driver does not get tired quickly.^[12]

COMPARISON PROBLEMS

Train

A train is a vehicle that requires a special track and can accommodate as many people as needed according to the carriage attached to the train. Trains are comfortable and safe if you can do this and save costs because trains can carry a lot of people.

Trains are indeed economical from a financial perspective, but trains will reduce the cultural activities of Balinese people who need comfort and safety in their activities.

The construction of the railway line can be carried out underground so as not to disturb the Balinese people's religious activities. Underground railway lines are expensive and require a longer time and the level of difficulty is quite high. Underground railroad lines are very difficult because all train lines will be underground.^[8]

Procurement of Light Rail (RLT)

Light rail requires a track above ground, this is very unlikely to be realized because Balinese culture will always be under ground so light rail does not get permission from the Balinese.^[25]

Self-Driving Cars

Is there still a need for vehicles that automatically drive themselves to avoid accidents.^[9]

Airport

Airports are very convenient and the airport on the island of Bali already has an airport, namely I Gusti Ngurah Rai International Airport in Tuban.

Sea Port

Bali already has 2 sea ports, namely Padangbai Port and Benoa Sea Port, these ports are still functioning well.

Ergonomic Recommendations

1. The only recommendation offered is to make roads wider or additional roads to facilitate road traffic by making other roads with the aim of speeding up the expansion of two-wheeled and four-wheeled transportation. Two-wheeled and four-wheeled transportation will always increase every year, while roads will not necessarily increase, so the only way to increase the smoothness of transportation is to add roads with lanes that can reduce traffic jams by paying attention to the jam points.^[23]
2. The second recommendation is to use public transportation provided by the government so that it can reduce privately owned four-wheeled vehicles.
3. Logically, private four-wheeled vehicles that are large enough to only be used to accommodate one or two people can cause traffic jams on the highway.
4. There must be public parking for two-wheeled vehicles and four-wheeled private vehicles in one place at certain points.

DISCUSSION

Bali is not too big, so a way has to be found to make Bali comfortable and safe with the presence of vehicles being very dense and causing traffic jams. In 2022, the number of motorbikes throughout Bali will reach 4,079,617 in every district throughout Bali. Denpasar has the most two-wheeled bicycles around 1,205,383 because Denpasar is the center of Bali. Badung is the second city to have two-wheeled motorbikes but Badung is the center of work and Denpasar is the closest distance to work so many people from other districts choose to live in Denpasar or rent.

Passenger cars from tourism areas can be sure to have a definite destination to the city center,

namely to Denpasar and Badung or to the tourism center. This process can be said to make the cities of Denpasar and Badung or tourism centers become congested and cause traffic jams. There are many things that cause traffic jams, one of which is the large number of vehicles going to one road or perhaps the destination of the vehicles being the same.^[18] What is clear is that there are too many private vehicles exceeding the capacity of the existing roads in addition to the large number of passenger vehicles.

A research design was created with the aim of finding a good way to create road lanes which will later be used as roads to reduce congestion caused by existing vehicles.^[13,24]

CONCLUSION

The conclusion that can be made is, The main thing is how to prepare good drivers to reduce problems on the road. Drivers must have the best certificate and a level of fitness to drive a car to drive on the highway. The next step is to be able to balance passengers with their existing vehicles so that this does not become a problem. How many vehicles and drivers must be balanced by survey to get the balance. It is necessary to schedule departure times for two-wheeled and four-wheeled vehicles to reduce traffic jams on the road. The solution of providing a train will most likely be rejected because of the existing cultural principles of the Balinese people.

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