Road Accident Cost
in Indonesia

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Abstract. *The traffic accident rate in Indonesia is still considerably high, as reported by the national police with around 60 accident casualties daily. Of these casualties, 24 of them are dead. This figure is relatively high at the ASEAN level where there are about 112 people died everyday because of traffic accidents. The objective of the study is to provide an initial estimation of the traffic accident loss and to use that estimation to assess the economic impacts of that event. Since the data used in the estimation are nationwide, then the final output of the study will be in the form of the accident loss in term of GDP proportion. Using the same calculation method, forecast of the total national accident cost for the next five years was made. The method to calculate the road accident cost covers four components: property damage, administrative cost, medical cost, and lost output. There are two important data needed in this method: aggregate accident data, and unit cost data for each component. Using these two types of data, the aggregate cost can be estimated, and at the same time, the total of certain types of cost. Using the 2002 Indonesia nominal GDP of 1.42 trillion rupiah, the total accident costs in Indonesia was estimated around 0.47% of GDP for Police Department reported data and 1.46% for the Health Department data. These figure is relatively high compared with, for example, Singapore that has figure of 0.46% of its GDP., For the next five years, the total amount accident cost which is saved by the action plan approximately about Rp10 trillion. This estimation still has under reporting problems for number of casualties and property damage, and under valued problem for the estimation of accidents unit cost.*

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1. Introduction

1.1 General

The traffic accident rate in Indonesia is still considerably high, as reported by the National Police Department with around 60 accident casualties daily. Of these casualties, 24 of them are dead. This figure is relatively high at the ASEAN level where there are about 112 people died everyday because of traffic accidents.

Considering that the accident casualties could also take place both on sea and air transportation, the total accident casualty is certainly higher. According to the insurance report, there are about 187 traffic casualties with 63 of them died everyday. To ascertain the quality of traffic accident data, the level of under-reporting associated with injury accidents should be estimated, because it will affect the computation of the national accident costs.

To estimate the 'economic cost' of traffic accident, the availability of the traffic accident casualties' data will be the necessary condition. It is far from easy to obtain that kind of data that could represent well the impact of traffic accidents to the national economic indicators. According to the national police report, the total loss of accidents reached 41 billion rupiah in 2002. The estimation in this study could produce different result due to the utilization of human capital method that is different with the one used by the national police.

1.2 Background

The main reason of this paper is to raise the issue of traffic accidents in two dimensions. First is the human dimension. The traffic accidents are basically unexpected events that could cause much type of losses such as material, physical, and most importantly, human life. Second, human as a capital is economic dimension, so the cost analysis is the further background of this study in order to get economic analysis.

The analysis of accident cost can be used for resource allocation at national level in terms of investment in the improvement of road safety. It is described simply by comparing the efforts to avoid or reduce the traffic accidents and the losses caused as the impacts of the accidents themselves. Hence, the expenditure of government bodies and individuals in the efforts to reduce the accidents should be classified as an economic investment that

certainly has to be taken into the comprehensive calculation of the economic impacts of road accidents.

To estimate the economic impacts of the accidents, the number of accidents casualties and the accident loss are the most needed data. Using human capital approach, the data should consist of administrative cost, hospital expenses, and the potential loss of human productivity. However, the reliability and availability of the data sometimes are doubtful.

1.3   Objectives

The objective of the paper is to provide an initial estimation of the traffic accident loss and to use that estimation to assess the economic impacts of that event. Since the data used in the estimation are nationwide, then the final output of the study will be in the form of the accident loss in term of GDP proportion.

The second objective is to compare the total national accident cost obtained from reported accident data from the National Police Department and data from the Health Department. The Health Department data was calculated in order to overcome the problem related to under reporting of the National Police Department data.

The last objective is to forecast the total national accident cost for the next five years using the same calculation method with national accident costing method in 2002. This national accident cost forecasting will be using Health Department data.

2.   Methodology

To calculate the impact of the traffic accidents in the monetary term is far from easy. First, it is an unexpected event. Second, the value of human life and safety is almost impossible to estimate. Everybody will have difficulty to reveal his/her 'safety price'. However, there are some approaches to estimate the economic impacts of the traffic accidents. According to Miller (1991), there are two general approaches to quantify the 'human safety', that is human capital method and comprehensive method. *Human capital method* calculates the direct cost of accidents such as vehicle repairing costs, medical treatment costs, and loss of productivity cost.

Comprehensive method basically estimates the insurance costs that reflects the compensation for the individuals who are trying to anticipate the negative impacts of the accidents.

The sources of data used in the study are from police, life insurance, Indonesia Central Board of Statistics (CBS) and interview with the car insurance customers, repair shop staff, and official staff in hospital.

2.1 Human Capital Method

This method combines the costs that take place during and after the traffic accidents. In other words, this is the *ex-ante* costs. The costs consist of administrative cost, vehicle repairing cost, medical treatment cost, and the *present value* estimation of the casualties' loss income due to the accidents. This method is also called the gross output method. To estimate the economic value of output loss, we use the 'average assumption' because the accidents could take place randomly at any income level. It is almost impossible to calculate accurately according to the individual income level. The medical treatment cost will be further classified as death and injury (that needs the hospital treatment). Human Capital Method is utilized for some reasons. The most substantial and primary reason is the availability of data.

2.2 Comprehensive Method

Comprehensive Method needs some particular requisites that extremely difficult to obtain in developing countries, including Indonesia. The data, like the standardized data in the National Police Department report and other related institutions, are not found yet.

The 2002 national data will be utilized for this study. The problem is that in Indonesia every institution has its own data version that is different to each other. As a result, there are difficulties to estimate the vehicle repairing cost and insurance reimbursement due to different classification used by each institution, namely insurance and the police.

3. Cost Components

The method to calculate the road accident cost covers four components: property damage, administrative cost, medical cost, and lost output. There are two important data needed in this method: aggregate accident data and unit cost data for each component. Using these two types of data, the aggregate cost can be estimated, and at the same time, the total of certain types of cost.

3.1 Property Damage

The accident data that involve the property damage are obtained from police and high-way company (PT Jasa Marga 2003). The vehicle damage cost could vary depending on the severity of the traffic accidents themselves. Hence, it is crucial to obtain the estimated cost of each level of accident severity for each traffic accident (unit cost).

To estimate this type of cost, the field survey to car services center will be useful to obtain the relevant cost in repairing the damaged cars according to the severity of the accidents and the type of vehicles. As a result, the cost estimation will not include the non-vehicle damage, such as damage to public infrastructure like lamp-post, guard-rails, traffic signs and the road surface.

Another problem identified was the different definition of the severity level of accidents. In general, the accident severity was measured based on how severe the accident casualties themselves. However, for property damage, the level of severity was measured based on the severity of vehicle damage. Although these might relate to each other, the reality clearly indicated that the traffic accident that caused the severe vehicle damage will not always cause serious casualties injury.

In this report, accident data from the National Police Department (2003) will be used as reported national data. But one problem that may occur is that the National Police Department does not classify accident data based on the level of severity.

3.1.1 Property Damage Estimation
for Indonesia

Almost every accident will cause vehicle damage, and in some cases, infrastructure damage such as traffic lights, electricity poles, and road marks. It means the cost will include both vehicle and infrastructure reparation. Estimation for these cost components is impossible due to the lack data from the National Police Department. Another relevant cost related to property damage is the car rental cost while the vehicle is under reparation. The rental cost is included in the estimation because one would have to rent a car if one's car got accident. However, in Indonesia, this might not be significant.

The cost estimation of property damage could be obtained from vehicle reparation center or service station. Another source of data and information is the car insurance company that should provide the total claim for vehicle damage that is caused by traffic accident. However, in Indonesia, the insurance data which are related to road accident are difficult to be collected. Further, there is possibility that the data will be bias because not all damage vehicles are covered by insurance. Hence, data and information from reparation center or service station should be enough to estimate unit cost of property damage. The vehicle services center provides the reparation cost data that includes machine repairing, body reparation cost, spare parts replacement cost, and other reparation and maintenance costs.

After obtaining the property damage cost per unit from the vehicle service station, the data on the total property damage will be certainly needed. These data are provided by the National Police Department (2003) and PT Jasa Marga (2003). The police data seems to be significantly under-reported, while the PT Jasa Marga data only covers the accidents on the toll road, i.e., 0.135% of the total road in Indonesia. However, the data from the National Police Department will be used as *reported data* because this department is the main source of vehicle damaged data. The National Police Department reported data will be compared with the Health Department data.

Some estimates can be made to measure number of property damage based on the level of severity by making assumption that the level of property damage is correlated with the level of casualties. With this assumption we can predict that a fatal accident can cause a fatal casualty and a serious damage on property. While there may be some correlation between injury sustained and wreckage caused, the relationship is not always proportional. For example, in

a pedestrian accident, the vehicle may have little or no vehicle damage but the injury sustained can be extremely serious; or the opposite can happen that a serious damage on property accompanied by a slight injured casualty. For this reason, some correction is made to accommodate this possible correlating, and some steps are executed to estimate total property damage cost:

Step 1
Calculate average amount of vehicles that cause each casualty.

There is no actual data that shows distribution of vehicle damaged by severity. To calculate the estimated proportion of vehicles, the distribution of casualty severity is used. This distribution is divided into three categories of casualties: fatal damage (37%), serious damage (25%), and slight damage (38%) (Table 1). The result shows the distribution for fatal, serious and slight damage casualties are 8,929, 6,012 and 8,762 respectively.

Table 1
ESTIMATED AVERAGE NUMBER OF VEHICLES PER CASUALTY

Type of vehicle involved in road accidents	Number of vehicles	Average number of vehicles by level of severity per casualty		
		Fatal damage (38%)	Serious damage (25%)	Slight damage (37%)
Public vehicles	1,654	0.07	0.07	0.07
Private vehicles	2,706	0.12	0.11	0.11
Heavy and light goods private vehicles	1,092	0.05	0.05	0.05
Heavy and light goods non-private vehicles	2,791	0.12	0.12	0.12
Public bus	1,084	0.05	0.05	0.04
Non-private bus	130	0.01	0.01	0.01
Motorcycles	8,518	0.37	0.35	0.35
Total	17,975	0.78	0.75	0.74

Note: - The interpretation of these figures is that the relative numbers of vehicle (unit) included in the traffic accident to people involved. For example, for each fatal damage of Private vehicles of 0.12, it means, there are 0.38 x 2,706 private divided by 8,929 people involved. Thus, for each fatal damage, private vehicles involved in this accident are 0.12 unit vehicle.
 - For each fatal damage, total vehicles involved in this accident are 0.78 unit vehicle.
Source: National Police Department R.I, 2003.

Step 2
Determine average number of vehicles damaged per casualty.

The number of vehicle presented in Table 1 does not reveal damaged vehicles only. According to previous study in South Africa[1], total vehicle

damage can be corrected 20% from total National Police Department reported data. There is a situation that can be envisaged where large vehicle or bus collides with one or more pedestrian causing fatal injuries, but insignificant vehicle damage. Using this assumption, we multiply the previous data with 80% (Table 2).

Table 2
ESTIMATED AVERAGE NUMBER OF VEHICLES DAMAGE PER CASUALTY
(WITH CORRECTION FACTOR)

Type of vehicles involved in road accidents	Number of vehicles	Average number of vehicles damage by level of severity per casualty		
		Fatal damage (38%)	Serious damage (25%)	Slight damage (37%)
Public vehicles	1,654	0.06	0.06	0.05
Private vehicles	2,706	0.09	0.09	0.09
Heavy and light goods private Vehicles	1,092	0.04	0.04	0.04
Heavy and light goods non-Private vehicles	2,791	0.10	0.09	0.09
Public bus	1,084	0.04	0.04	0.04
Non-private bus	130	0.00	0.00	0.00
Motorcycles	8,518	0.30	0.28	0.28
Total	**17,975**	**0.62**	**0.60**	**0.60**

Source: National Police Department R.I, 2003.

Step 3
Calculate vehicle damage cost by type of vehicles.

Data of vehicle damage unit cost was obtained from field survey to reparation center or service station. This data contained only two types of vehicles, car and motorcycle. It is assumed that unit cost of car damage represents all types of car. The survey was conducted in Jakarta in 2003.

The amount of property damage cost by level of damage is presented in Table 3 and Table 4.

Table 3
AVERAGE UNIT COST OF CAR DAMAGE BY LEVEL OF SEVERITY

Level of damage	Repairing categories	Unit cost (Rp)
Fatal damage	Machine repairing	1,000,000.00
	Body repair	5,000,000.00
	Spare parts	3,000,000.00
	Total	**9,000,000.00**
Serious damage	Body repair	1,500,000.00
	Spare parts	1,000,000.00
	Total	**2,500,000.00**
		(Continued)

(Continuation Table 3)

Level of damage	Repairing categories	Unit cost (Rp)
Slight damage	Body repair	750,000.00
	Spare parts	100,000.00
	Total	**850,000.00**

Source: Field survey, 2003.

Table 4
AVERAGE UNIT COST OF MOTORCYCLE DAMAGE BY
LEVEL OF SEVERITY

Level of damage	Repairing categories	Unit cost (Rp)
Fatal damage	Machine repairing	200,000.00
	Body repair	300,000.00
	Spare parts	1,000,000.00
	Total	**1,500,000.00**
Serious damage	Body repair	100,000.00
	Spare parts	900,000.00
	Total	**1,000,000.00**
Slight damage	Body repair	100,000.00
	Spare parts	400,000.00
	Total	**500,000.00**

Source: Field survey, 2003.

Aggregation on type of vehicles into car's type and motorcycle's type has to be done due to the availability of unit cost data. The proportions of vehicles by level of severity per casualty can be shown in Table 5.

Table 5
AVERAGE NUMBER OF VEHICLE DAMAGE BY CAR AND MOTORCYCLE

Type of vehicles involved in road accidents	Number of vehicles	Average number of vehicles damage by level of severity per casualty		
		Fatal damage (38%)	Serious damage (25%)	Slight damage (37%)
Car	9,457	0.33	0.31	0.31
Motorcycle	8,518	0.30	0.28	0.28
Total	**17,975**	**0.62**	**0.60**	**0.60**

Source: National Police Department R.I, 2003.

Then, the calculation of the damage cost of vehicle, by type and per casualty, can be done by multiplying the unit cost and its average number distribution (Table 6).

Table 6
CALCULATION OF AVERAGE DAMAGE COST PER VEHICLE PER CASUALTY

Type of Vehicles Involved in Road Accidents	Number of Vehicles	Unit cost of vehicles damage by level of severity per casualty (Rp)		
		Fatal damage	Serious damage	Slight damage
Car	9,457	2,953,018.95	786,510.31	66,477.90
Motorcycle	8,518	443,301.53	283,366.60	41,187.59
Total	**17,975**	**3,396,320.47**	**1,069,876.91**	**407,665.49**

Notes:
- Unit cost for fatal damage are Rp9 million for car and Rp1.5 million for motorcycle.
- Unit cost for serious damage are Rp2.5 million for car and Rp1 million for motorcycle.
- Unit cost for slight damage is Rp850 thousands for car and Rp500 thousands for motorcycle.

Step 4
Calculate the total vehicle damage cost with the number of casualties by type of severity (National Police Department reported data).

The further calculation is multiplying this distribution of average unit cost with the total number of casualties produced by the National Police Department reported data (Table 7).

Table 7
TOTAL VEHICLE DAMAGE COST BY TYPE OF SEVERITY

Type of vehicles involved in road accidents	Number of vehicles	Total cost of vehicles damage by level of severity (Rp)			Total Cost (Rp)
		Fatal damage	Serious damage	Slight damage	
Car	9,457	25,874,352,000	4,728,500,000	2,379,381,200	32,982,233,200
Motorcycle	8,518	3,884,208,000	1,703,600,000	1,260,664,000	6,848,472,000
Total	17,975	29,758,560,000	6,432,100,000	3,640,045,200	39,830,705,200

Step 5
Adding the property damage only cost (PDO).

Property damage only (PDO) cost is vehicle damage cost that comes from single accident which can not be calculated using crash data. International PDO proportion assessment is utilized to get the Indonesian calculation of property damage only, due to unreported PDO data in Indonesia. From international experience, like Thailand, there is about 5.3 PDO per injury. The most reasonable proportion for Indonesia is 2 PDO per injury, to avoid over estimating calculation. The data of the total injured casualties are from the Health Department that was about 2,550,000 in 2002, due to unavailability of National Police Department report on this necessity. The unit cost of PDO is estimated at Rp500 thousands for each vehicle. The number of PDO was 5,100,000 (2 PDO in each injury multiplied by 2,550,000 injuries). Thus, the total PDO cost was Rp2.55 trillion in 2002.

There are some indications that accident data from the National Police Department are under-reporting, so a comparison was made between the National Police Department data and Health Department data (Table 8). The final output from the same steps with the previous data is shown in the next paragraph.

Table 8
COMPARISON BETWEEN NATIONAL POLICE DEPARTMENT DATA
AND HEALTH DEPARTMENT DATA

	National Police Department data	Health Department data
Fatal casualties	8,762	30,000
Serious injured casualties	6,012	450,000
Slight injured casualties	8,929	2,100,000
Total casualties	23,703	2,580,000
Total accidents	12,267	1,335,226*

Note: * Estimated data using casualties ratio between the National Police
Department and Health Department, 2003.

Using the same steps with the National Police Department reported data, and with some adjustment in type of casualties' severity into two types only (fatal and injured casualties), the Health Department data show that total property damage cost is higher than the National Police Department reported data, or Rp4,011,225,191,699.64.

3.2   Administrative Costs Estimation for Indonesia

Aside from property damage, the traffic accidents also produce the administrative costs. These costs are paid by various institutions that are related to the accidents themselves such as police, some ministries, insurance (both vehicle and life), and hospitals. However, this cost estimation is sometimes ambiguous. Police, for instance, has the program to minimize the accidents through the assignment of its squads, but the funding for that program is not necessarily provided to minimize the accident but it might come from any other program such as routine management of traffic.

In any accident, the administrative costs could be linked to the severity of the accidents. In a major accident where there is serious motor vehicle damage, the police might have to deal with that directly, and after that it may need a long procedure of investigation, insurance claims, and other legal procedures. This might lead to higher administrative costs. For the casualties themselves, there could be additional administrative costs such as funeral cost for fatal casualty.

Administrative cost could occur from the cost paid by institution related to road accident. In this report there are four agencies that have to pay this kind of cost. First, the cost related to the National Police Department, such as administration cost of investigation and operational cost on personnel and vehicles to manage safety-related work. Second, the annual budget of the Ministry of Transportation used for managing road safety program. Third, the cost that appears on the insurance claim process. And the last is funeral cost which is paid by individual in society (Table 9).

Table 9
IDENTIFICATION OF ADMINISTRATIVE COST

Agency	Identification of administrative cost
National Police Department	- Administration cost of investigation - Operational cost on personnel and vehicles
Ministry of Transportation	Annual budget on traffic control or managing road safety objectives
Insurance company	Administrative cost on claim process
Society	Funeral cost

The administrative cost component related to the accidents only occurs to the police data in the form of administration cost of investigation by the Police Department. The cost is Rp52,000.00 for every major case, and Rp15,500.00 for every minor case. Based on the assumption that most of the cases are major cases, with the total of 12,267 cases, the total administrative cost could reach Rp637 million in 2002. This component also includes other types of cost in minimizing the accidents such as intersection monitoring and highway patrols.

The assumption is that on average, the total police officers involved in this program are about 22% of the total police squads, especially the low-ranks officers. With the assumption that this program utilizes one operational car for every two officers, the total operational costs reached about Rp50.52 billion in 2002 (Table 10).

Table 10
TRAFFIC CONTROL COST OF NATIONAL
POLICE DEPARTMENT 2002

Cost component	Cost per unit (Rp)	Unit	Annual cost (Rp)
Personnel/day	10,000.00	4,943 personnels	18,041,950,000.00
Operational cost of motor vehicles	13,140,000.00	2,471 motor vehicles	32,468,940,000.00
Total			50,510,890,000.00

Second is the routine costs spent by the Ministry of Transportation to minimize the accidents through the activities such as road improvement projects. It is estimated around Rp300 million per year. The total estimation in 2002 was about Rp6.94 billion with the number of the casualties 69,745.

The third component is insurance administration cost, either vehicle insurance or life insurance. This cost component contained not only cost that is charged by insurance company as administrative cost, but also cost that occurs in the claim process such as the telephone bill and transportation cost. For damage on vehicle, average administrative cost in processing the claim is Rp150,000.00 (the reported number of vehicle was 17,975, thus the total cost of vehicle insurance was Rp2,696,250.00), while for life insurance is less than Rp50,000.00 (the number of casualties was 23,703, thus the cost of life insurance was Rp1,185,150,000.00). This data obtained from field survey (interview) that was conducted in Jakarta to insurance consumers in 2003.

From the data above, it is shown that total insurance administrative cost for the National Police Department reported data in 2002 is Rp3,881,400,000.00 which represents the actual insurance administrative cost.

Another cost component that should also be taken into consideration is the funeral cost. The cost is about Rp300,000 per fatal casualty[2] and with the total fatal casualty of 8,762 in 2002, the total funeral cost is Rp2.6 billion while for the Health Department data total funeral cost is Rp9.1 billion (Table 11). Hence, the cost may be biased because funeral cost varies according to the location. In rural area, this cost can be much lower than in urban area, especially in the metropolitan cities like Jakarta.

Table 11
ESTIMATED FUNERAL COST

Fatal casualties (death)	Number of fatal casualties (death)	Unit cost (Rp)	Total cost (Rp)
Nat. Police Dept. reported data	8,762	300,000.00	2,628,600,000.00
Estimated from Health Department data*	30,464	300,000.00	9,139,200,000.00

Note: * ADB – ASEAN, 2004 (Draft).

Table 12 below is the recapitulation of total cost components in administrative cost.

Table 12
ESTIMATED TOTAL COST IN ADMINISTRATIVE COST

Components of administrative cost	Cost estimation 1 (Rp)	Cost estimation 2 (Rp)
Administrative cost of investigation by National Police Department	637,884,000.00	637,884,000.00
Cost of National Police Department:		
- Personnel	18,043,066,307.11	18,043,066,307.11
- Motor vehicles operational cost	32,477,519,352.79	32,477,519,352.79
Ministry of Transportation's annual budget on traffic control	300,000,000.00	300,000,000.00
Insurance administrative cost	3,881,400,000.00	3,881,400,000.00
Funeral cost*	2,628,600,000.00	9,139,200,000.00
Total Cost	**57,955,124,000.00**	**64,465,724,000.00**

Note: * ADB – ASEAN, 2004 (Draft).

3.3 Medical Costs

The medical costs could vary depend on the severity of the accidents themselves. The minimum cost is the ambulance cost if the casualty is not severely injured. But if the casualties are severely injured, then there will be additional cost in term of the 'on the spot' medical treatment. The costs will go higher if the casualties need further special treatments at the

hospital. However, if the casualties passed away instantly, the costs will be lower since it only covers the related funeral costs.

3.3.1　Medical Costs Estimation for Indonesia

The medical cost basically varies due to severity of injury and the type of hospitals. For fatal accident case, the cost will cover the number of hospitalized days, surgery cost (if applied), medical check-up, drugs, and doctor services. For serious injury cases, the data and information needed are the number of hospitalized days, medical check-up, and doctor services. For minor injury case, the data should include the number of hospitalized days, on-going treatment, and other related costs.

3.3.2　Identification of Medical Cost

To calculate medical cost, it requires data on the cost according to the level of severity. There are some steps to calculate the total medical cost (Table 13 and Table 14).

Step 1
Calculate the amount of each medical cost components.

Table 13
IDENTIFICATION OF MEDICAL COST COMPONENTS

Level of Severity	Identification of medical cost components	Total unit cost (Rp)
Very slight injured casualty	Medical check-up, doctor services and drugs, less than Rp1 million	1,000,000.00
Slight injured casualty:	- Surgery cost about Rp3 million - Cost of hospitalization days, drugs and on-going treatment is Rp2 million - Ambulance cost is Rp100 thousands	5,100,000.00
Serious injured casualty:	- Surgery cost about Rp8 million - Drugs and cost of on-going treatment is Rp2 million - Ambulance cost Rp100 thousands million	10,100,000.00

Notes: * Field survey, 2003.

<u>*Step 2*</u>
Calculate total cost from each type of casualties' severity.

Table 14
MEDICAL TOTAL COST

Reported Data of National Police Department	Number of casualties	Medical unit (Rp)	Total cost (Rp)
Slight injured casualty	8,929	4,100,000.00	36,608,900,000.00
Serious injured casualty	6,012	10,100,000.00	60,721,200,000.00
Total			97,330,100,000.00

Therefore, the Health Department data to cover under reporting of the National Police Department data can be presented in the Table 15.

Table 15
MEDICAL TOTAL COST BASED ON HEALTH DEPARTMENT DATA

Health Department data	Number of casualties	Medical unit cost (Rp)	Total cost (Rp)
Fatal casualty	30,000	1,000,000.00	303,000,000,000.00
Slight injured casualty	450,000	5,100,000.00	2,665,599,420,000.00
Serious injured casualty	2,100,000	10,100,000.00	4,377,651,080,000.00
Total	2,580,000		7,043,250,500,000.00

From the result above, the total number of estimated casualties yields the medical cost that is 700 times higher than National Police Department reported data. Regarding the number of estimated casualties that is four times than the reported data, the income lost that must be added in the estimated data then increased sharply.

3.4   Loss of Output (Income)

The loss of output (income) in the national economy could take place due to the loss of productive working time as a result of traffic accidents. The loss of productive time takes place not only on the accident scene, but also on the vehicle service station, hospital, on-going treatment,

medical rehabilitation, and public court. For the fatal accident, the loss will be caused by the lost productivity of the remaining productive ages (the retired age minus the death age). In many cases, this last component, in fact, contributes most to the loss of output (income) due to traffic accidents.

The loss of productive time at the accident scene could also affect other people surround the scene but it is extremely difficult to estimate this kind of loss. The traffic congestion caused by the accident might not be produced solely by the accident itself, but could be influenced by the location and the time of accident.

To estimate the loss of output, there has to be the proxy of productive time value. This value is calculated based on the average wage of casualties that depends on the type of jobs and their ages. The loss of productive time could also take place for the people who voluntarily help the casualties during their recovery period. This is extremely difficult to calculate especially if the casualties are the children.

For the fatal accident cases, the loss of productive time is basically the number of remaining productive ages since the casualties pass away. The data on the casualty age, retirement age, and average income by ages are necessary to be obtained in order to do the cost estimation. The police, at least, provides the age distribution of the accident casualties. The average wage to estimate the output loss will be very crucial. The wage should consider not only the casualties' age, but also its possible increment annually. The type of jobs is certainly another factor to consider. Since it is difficult to have the wage data by ages, the study utilizes the national average annual wage. Another alternative, aside from the wage, is by using the GDP per capita. Both the wage and GDP per capita data are easily available.

3.4.1 The Estimation of Output (Income) Loss
in Indonesia

The cost component of the fatal accident casualties is the loss of productivity on the remaining productive ages. In the other hand, for injured-casualties, the loss of productivity can be valued by the time loss needed due to medical care treatment. The estimation of this component will be based on the data of the casualties' distribution ages provided by the National Police Department and average wage by ages provided by the Central Board of Statistics (CBS) for the year 2002.

The lost output (income) is estimated based on the average wage by ages multiplied by the total casualties and the remaining productive ages. In this study, the average retirement age in Indonesia is 60 years old. The steps below will demonstrate the stages to calculate the value.

Step 1
Calculate the distribution of casualties by age.

Data from the National Police Department in 2002 show the distribution of casualties by age as presented in Table 16. The problem is that this proportion is not the right proportion for fatal casualties, but for the entire casualties, fatal and injured. Therefore we multiply number of casualties by age with 38%, which is the proportion of fatal casualties reported by the National Police Department (Table 16).

Table 16
DISTRIBUTION OF CASUALTIES BY AGE, 2002

Age	Number of casualties	Proportion (%)
5-15	421	3.1
16-21	3,496	26.0
22-30	4,491	33.4
31-40	3,090	23.0
41-50	1,458	10.9
51-60	477	3.6
Total	13,433	100.0

Source: National Police Department R.I, 2003.

Step 2
Calculate economic value of fatal casualties (death) by age.

The loss of productivity from fatal casualties is the value of casualties' remaining productive age, which is from the economic point of view, can be valued from average wage by age. Average wage is changing overtime with the increase of casualties' age if they are 'still' alive. The trend of average wage by age is increasing overtime, unless in the latest period where the value is decreasing.

For example, if a victim is killed in an accident and his age is about 35 years, the total loss productivity are the sum of income of remaining age,

that is; 5 productive years multiplied by annual wage rate of 31-40 age group, plus 10 productive years multiplied by annual wage rate of 41-50 age group, plus 10 productive years multiplied by annual wage rate of 51-60 age group.

Table 17a and Table 17b show that in 2002 the loss of productivity for fatal casualties almost reaches Rp2 trillion for the National Police Department reported data and is about Rp7 trillion for Health Department data.

Table 17a
TOTAL LOSS OF PRODUCTIVITY ESTIMATION CAUSED BY FATALITIES, 2002

Age	Annual average wage (Rp)	Distribution of fatalities by age (%)	Number of fatalities	Productive years forgone	Estimated loss of productivity (Rp)
5-15	3,994,908.00*	3	275	50	88,433,395,476.40
16-21	3,994,908.00	26	2,280	44	679,695,527,531.72
22-30	5,980,284.00	33	2,929	35	715,478,500,975.19
31-40	7,488,604.00	23	2,016	25	341,344,929,003.17
41-50	8,905,458.00	11	951	15	38,184,732,181.49
51-60	8,030,304.00	4	311	5	12,492,535,837.15
Total			8,762		1,875,629,621,005.13

Note : * Since there is no available data for 5-15 age group, we assumed that average wage for this group is
        similar to 16-21 age group.
Source: National Police Department reported data, 2003.

Table 17b
TOTAL LOSS OF PRODUCTIVITY ESTIMATION CAUSED BY FATALITIES, 2002

Age	Annual average wage (Rp)	Distribution of fatalities by age (%)	Number of fatalities	Productive years forgone	Estimated loss of productivity (Rp)
5-15	3,994,908.00	3	955	50	307,468,039,236.84
16-21	3,994,908.00	26	7,928	44	2,363,187,006,474.14
22-30	5,980,284.00	33	10,185	35	2,487,598,385,495.11
31-40	7,488,604.00	23	7,008	25	1,430,206,247,647.32
41-50	8,905,458.00	11	3,307	15	559,984,721,285.00
51-60	8,030,304.00	4	1,082	5	43,434,445,531.05
Total			30,464		7,191,878,845,669.45

Source: Health Department data, 2003.

Step 3
Calculate the loss of income of injured casualties.

The assumption for the accidents with injured casualties was that the casualties have to be in one month medical treatment and this one month is their lost productive time. Therefore, monthly average wage was used and multiplied with the number of injured casualties and medical care days (Table 18a and Table 18b).

Table 18a
TOTAL LOSS OF PRODUCTIVITY ESTIMATION CAUSED BY CASUALTIES INJURED, 2002

Age	Monthly average wage (Rp)	Proportion of casualties (%)	Number of casualties	Medical care days (in month)	Loss of productivity (Rp)
5-15	332,909.00	3	468	1	155,888,573.54
16-21	332,909.00	26	3,888	1	1,294,504,639.17
22-30	498,357.00	33	4,995	1	2,489,374,685.41
31-40	624,050.33	23	3,437	1	2,144,789,870.75
41-50	742,121.50	11	1,622	1	1,203,480,862.75
51-60	669,192.00	4	531	1	355,038,761.97
Total			14,941		7,643,077,393.59

Source: National Police Department reported data, 2003.

Table 18b
TOTAL LOSS OF PRODUCTIVITY ESTIMATION CAUSED BY CASUALTIES INJURED, 2002

Age	Monthly average wage (Rp)	Proportion of casualties (%)	Number of Casualties	Medical care days (in month)	Loss of productivity (Rp)
5-15	332,909.00	3	79,919	1	26,605,706,614.31
16-21	332,909.00	26	663,649	1	220,934,798,868.46
22-30	498,357.00	33	852,531	1	424,864,831,523.12
31-40	624,050.33	23	586,578	1	366,054,090,783.89
41-50	742,121.50	11	276,774	1	205,399,651,965.31
51-60	669,192.00	4	90,549	1	60,594,929,591.31
Total			2,550,000		1,304,454,009,346.39

Source: Health Department data, 2003.

The tables show that in 2002 the loss of productivity for injured casualties is about Rp7.6 billion for reported data from the National Police Department and about Rp1.3 trillion for the Health Department data.

Other cost component not included in this calculation is casualties' waiting time for searching other job if they cannot continue previous jobs. In many instances, productive loss does not only affect the casualty but also the voluntary care-givers who may be family members or relatives of the casualty. This is seldom captured since the total amount of time lost and the wage rate cannot be easily ascertained.

3.6   Human Costs

Despite of the direct effect of accident to the economy there are also other effects that influence the quality of life, such as suffering from pain. All injured casualties would suffer from both physical and emotional, therefore based on the 'willingness to pay method', these effects should be calculated.

This study adopts the proportion recommended by the Transport Research and Laboratory which is calculated as follows:

-   28 % of total costs for a fatal accident,
-   50 % of total costs for a serious injury,
-   8% of total costs for a slight injury.

Based on these percentages of total costs, the human costs for fatal accident can be seen in Table 19.

Table 19
HUMAN COST FOR FATAL ACCIDENTS, INDONESIA, 2002
(IN RP)

	Fatal injured	Serious injured	Slight injured
National Police Department data	534,423,306,201.44	38,309,705,696.79	3,977,204,527.49
Health Department data	2,045,104,376,477.67	1,819,278,365,406.11	342,234,742,043.50

3.7   Aggregate Costs

The following tables (Table 20 and Table 21) summarize all components of costs due to traffic accidents. The lost output (income) was the biggest component with the value of Rp2 trillion for the National Police Department reported data while the Health Department data show the value seven (7) times higher. The property damage itself only contributes less than 2% for the National Police Department reported data while in Health Department data the proportion is much lower, about 0.4%. There is a significant difference between the Health Department and National Police Department reported data result in the proportion of medical cost. In the Health Department data, the proportion of injured casualties is much higher than fatal casualties. It leads to the higher proportion of medical cost.

Table 20
NATIONAL COST OF ACCIDENTS, INDONESIA, 2002

Cost components	Value (Rp)	Proportion (%)
Property damage	4,011,225,191,699.64	60.53
Administrative cost:		
- Cost of investigation	0.0	0.00
- Cost of Police Department	637,884,000.00	0.01
Personnel	18,043,066,307.11	0.27
Motor vehicles operational cost	32,477,519,352.79	0.49
Transportation Department annual cost of traffic control	300,000,000.00	0.00
Insurance cost	3,881,400,000.00	0.06
Burial plot cost	2,628,600,000.00	0.04
Medical cost:		
- Total medical care cost	97,330,100,000.00	1.47
Loss output:		
- Injured	7,643,077,393.59	0.12
- Fatalities	1,875,629,621,005.13	28.30
Human cost	576,710,216,425.72	8.70
Total	6,626,506,676,183.97	100.00
% of GDP	0.47%	

Source: National Police Department reported data, 2003.

Table 21
NATIONAL COST OF ACCIDENTS, INDONESIA, 2002

Cost components	Value (Rp)	Proportion (%)
Property damage	4,011,225,191,699.64	19.4
Administrative cost:		
- Cost of investigation	637,884,000.00	0.0
- Cost of Police Department		0.0
Personnel	18,043,066,307.11	0.1
Motor vehicles operational cost	32,477,519,352.79	0.2
Transportation Department annual cost of traffic control	300,000,000.00	0.0
Insurance cost	3,881,400,000.00	0.0
Burial plot cost	9,139,200,000.00	0.0
Medical cost:		
- Total medical care cost	3,945,000,000,000.00	19.0
Loss output:		
- Injured	1,304,454,009,346.39	6.3
- Fatalities	7,191,878,845,669.45	34.7
Human cost	4,206,617,483,927.27	20.3
Total	20,723,654,600,302.60	100.0
% of GDP	1.46%	

Source: Health Department data, 2003.

4. National Accident Cost

The national accident cost is obtained through totaling all component costs. The total is then compared to the Indonesia GDP in 2002 in order to estimate the national loss percentage.

4.1 Quality of Data

The data used to estimate the national accident cost still have some problems. First, there is no single formal data of traffic accidents since every institution seems to produce their own data without coordination. The data released by the National Police Department is far below the Health Department data. It could happen because the mild injured casualties are not

reported to the police, and as a result the problem of under reporting becomes obvious. Aside from that, the data of insurance claims to estimate the property damage are still under estimate since only minority of vehicle owners use the vehicle insurance services.

In addition to under reporting problem, the miss recording is another serious problem. The hospital is frequently only interested in injury treatment rather than the cause of injury. It might happen since the hospital does not consider the cause of injury as an important matter.

4.2 National Cost Calculation

Using the 2002 Indonesia nominal GDP of Rp1.42 trillion, the total accident costs in Indonesia was estimated around 0.47% of GDP for the National Police Department reported data and 1.46% for the Health Department data. This figure is relatively high compared with, for example, Singapore that has the figure of 0.46% of its GDP (ADB-ASEAN 2004). As briefly mentioned, this estimation still has under reporting problems for number of casualties and property damage, and under valued problem for the estimation of accidents unit cost.

4.3   Constraints

There is strong assumption about the true value of property damage cost that should be higher than Rp59 billion The result shows that the property damage cost was less than Rp59 billion due to the lack of property damage data, similar to the case of the National Police Department data. It is strongly recommended to calculate the real cost by surveyed data in the next similar research.

The lost output does not cover the loss of the family's (career) productivity, while they take care of the casualties. It also does not cover the opportunity cost of the workers who get permanent disability and must search the new job.

The medical cost uses aggregation data about the total day spent in caring, so there will be potential bias due to this aggregation.

5. Saving

Action plan which is conducted should decrease amount of money lost in road accident. Based on the growth of vehicles, the pattern of accident casualties can be predicted mathematically. Using linear estimation method, the results are shown in Table 22a and Table 22b.

Table 22a
FORECASTING RESULT WITHOUT ACTION PLAN

Year	Fatal	Injury	
		Serious	Slight
2005	37,019	511,637	805,100
2006	39,290	543,028	854,495
2007	41,605	575,014	904,829
2008	43,962	607,597	956,100
2009	46,363	640,775	1,008,309
2010	48.807	674,549	1,061,455

Table 22b
FORECASTING RESULT WITH ACTION PLAN

Year	Fatal	Injury	
		Serious	Slight
2005	36,128	499,319	785,716
2006	37,458	517,700	814,640
2007	38,782	535,997	843,432
2008	40,100	554,220	872,107
2009	41,414	572,378	900,680
2010	42,724	590,479	929,164

The number of casualties is a parameter to estimate the cost of accident in the future. Applying the previous computation method (2002 data), the Table 23 shows amount of money that will be spent in accident for the next five years. This calculation is likely bias because of lack of data in property damage category. So the final result is assumed not bigger than the true value of accident cost in Indonesia.

Table 23
PREDICTED ACCIDENT COST FOR THE NEXT 5 YEARS
(IN RP)

Year	Accident Cost		Saving of accident cost
	With action plan	Without action plan	
2005	17,725,598,128,937.50	18,159,909,555,285.30	434,311,426,347.79
2006	18,373,682,376,468.70	19,266,696,587,165.60	893,014,210,696.91
2007	19,018,798,248,051.80	20,390,260,360,817.60	1,371,462,112,765.84
2008	19,661,309,383,500.20	21,543,296,048,958.40	1,881,986,665,458.23
2009	20,297,487,462,254.90	22,713,108,478,871.00	2,415,621,016,616.07
2010	20,879,897,148,140.70	23,903,929,374,794.30	3,024,032,226,653.67
Total	115,956,772,747,354.00	125,977,200,405,892.00	10,020,427,658,538.50

For the next five years, the total amount accident cost which will be saved by the action plan will approximately be about Rp10 trillion. Using the exchange rate US$1 equals to Rp8,500, its amount will be about US$1.17 billion. This calculation is using particular assumption about the property damage cost. Since there is no actual data of property damage, the proportion of casualties was used as benchmark estimation.

6. Concluding Remarks

With the significant under reporting problem, the total cost of traffic accident in Indonesia was about Rp6.6 trillion or 0.47% of 2002 GDP in the National Police Department reported data, and about 1.46% in the Health Department data that explained in other sections of this paper. This relatively high percentage should push the government to do more investment on the road safety program.

To support that effort, all institutions that are responsible or have interests in traffic accident data should cooperate with each other in order to produce more accurate (and uniform) data. One data component that needs to be improved much is the data on the causes of accidents.

Notes

1. This assumption is based on similarity between Indonesia and South Africa as developing countries.

2. It is Jakarta's rate, some other places can vary in this term depend on their welfare level.

References

ADB-ASEAN. 2004. *Regional Safety Program, Accident Costing Report: AC08 Accident Cost in Singapore*. The Chartered Institute of Logistic and Transport, Singapore, November 2003.

ADB-ASEAN. 2004. *Regional Safety Program, Accident Costing Report: AC08 Accident Cost in Thailand*. Thailand Local Road Safety Adviser for ADB, Bangkok, March 2004.

ADB-ASEAN. 2004. Road Accident Cost in Indonesia 2002. (Draft)

Asosiasi Perusahaan Asuransi Indonesia. 2003. *Data Prosentase Klaim Asuransi Untuk Kendaraan Bermotor Tahun 2002* (Data of Claim Percentage on Vehicle Insurance 2002). Indonesia.

Central Board of Statistics (CBS). 2002. *Environmental Statistics of Indonesia 2001: Total Number of Accidents and Victims By Province.* Jakarta, Indonesia.

--------. 2002. *Wage Statistics 2001*. Jakarta, Indonesia.

--------. 2003. *Wage Statistics 2002.* Jakarta, Indonesia.

--------. 2003. *National Transportation Statistics 2002*. Jakarta, Indonesia.

Miller, Ted. 1991. *The Cost of Highway Crashes*. FHWA, Washington DC, Publication, No. FHWA-RD-055.

National Police Department R.I. 2003. *Polantas Dalam Angka 2002: Jumlah Korban Lalu Lintas Menurut Tingkat Kerusakan dan Golongan Umur* (Police of Transportation in Figure 2002: Number of transportation casualties by level of damage and age group). Directorate of Traffic, Jakarta, Indonesia.

PT. Jasa Marga. 2003. *Jumlah Kecelakaan di Ruas Jalan Tol 2002.* http://www.jasamarga.com/ind_index.html.

PT Jasa Raharja. 2002. *Life Insurance: Jumlah Korban Jiwa Kecelakaan Lalu Lintas Darat* (The Number of Road Accident Casualties). Divisi Pelayanan Kantor (Division of Office Services).

PT Jasa Marga. 2003. *Jumlah Kecelakaan di Ruas Jalan Tol 2002*. (The Number of Casualties in High Way 2002). http://www.jasamarga.com/ind_index.html.

Silcock, Ross. 2003. *Guidelines for Estimating the Cost of Road Crashes in Developing Countries: Final Report.* Department for International Development, May 2003, London.

Victoria Transport Policy Institute. 2003. *Transportation Cost and Benefit Analysis* (www.vtpi.org).
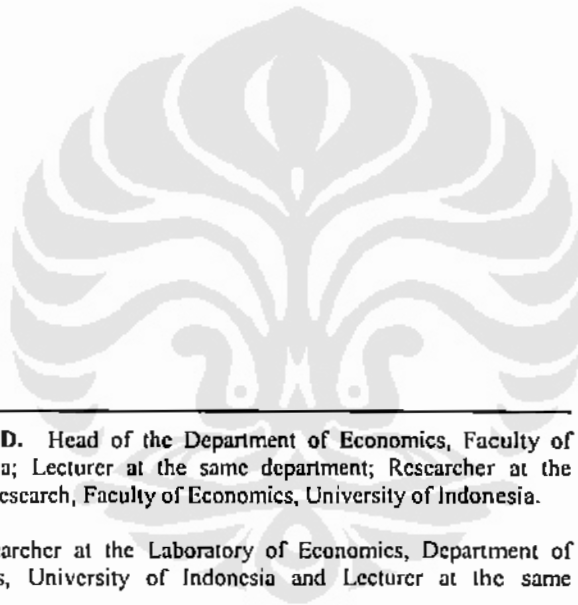
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Appendix

Traffic Statistics

Table 1
TOTAL CLAIMS AND GROWTH OF LIFE INSURANCE
(PASSENGER AND MOTOR DRIVER)

Year	Casualties	Growth (%)	Claims (Rp)	Growth (%)
1997	56,467	Na	77,062,064	na
1998	59,671	5.7	159,489,263	107.0
1999	57,496	-3.6	160,788,506	0.8
2000	52,322	-9.0	148,564,099	-7.6
2001	53,555	2.4	212,081,393	42.8
2002	67,538	26.1	151,550,061	-28.5

Source: PT Jasa Raharja, 2002.

Table 2
NUMBER OF CASUALTIES
(PASSENGER AND MOTOR DRIVER)

Casualties category	2001	2002	Change (%)
Injured	35435	44,035	24.3
Fatalities	18,120	23,503	29.7
Total	53,555	67,538	26.1

Source: PT Jasa Raharja, 2002.

Table 3
NUMBER OF CASUALTIES BY CASUALTIES CATEGORY IN REGIONAL POLICE DEPARTMENT, 2002

Regional Police Department	Total casualties	National distribution (%)	Casualties						
			Fatal	Distribution (%)	Serious Injury	Distribution (%)	Slight Injury	Distribution (%)
N. Aceh Darus.	486	2,1	113	23,3	157	32,3	216	44,4
North Sumatra	1,662	7,0	544	32,7	492	29,6	626	37,7
West Sumatra	691	2,9	269	38,9	180	26,0	242	35,0
Riau	681	2,9	307	45,1	206	30,2	168	24,7
West Kalimantan	409	1,7	146	35,7	68	16,6	195	47,7
South Sumatra	684	2,9	301	44,0	150	21,9	233	34,1
DKI Jakarta	938	4,0	262	27,9	496	52,9	180	19,2
West Java	2,716	11,5	1,081	39,8	752	27,7	883	32,5
Central Java	2,729	11,5	908	33,3	558	20,4	1,263	46,3
East Java	3,692	15,6	1,398	37,9	940	25,5	1,354	36,7
Bali	741	3,1	336	45,3	182	24,6	223	30,1
East Kalimantan	796	3,4	376	47,2	208	26,1	212	26,6
South Kalimantan	444	1,9	228	51,4	75	16,9	141	31,8
South Sulawesi	964	4,1	574	59,5	226	23,4	164	17,0
North Sulawesi	1,029	4,3	261	25,4	189	18,4	579	56,3
Maluku	118	0,5	41	34,7	40	33,9	37	31,4
Papua	878	3,7	192	21,9	228	26,0	458	52,2

(Continued)

(Continuation – Table 3)

Regional Police Department	Total casualties	National distribution (%)	Casualties					
			Fatal	Distribution (%)	Serious Injury	Distribution (%)	Slight Injury	Distribution (%)
Central Sulawesi	302	1,3	99	32,8	77	25,5	126	41,7
Southeast Sulawesi	186	0,8	122	65,6	37	19,9	27	14,5
West Nusa Tenggara	371	1,6	204	55,0	81	21,8	86	23,2
East Nusa Tenggara	707	3,0	212	30,0	190	26,9	305	43,1
DIY. Yogyakarta	1,027	4,3	180	17,5	94	9,2	753	73,3
Lampung	583	2,5	226	38,8	139	23,8	218	37,4
Jambi	289	1,2	135	46,7	85	29,4	69	23,9
Bengkulu	294	1,2	111	37,8	77	26,2	106	36,1
Total	23,703	100,0	8,762	37,0	6012	25,4	8,929	37,7

Source: National Police Department RI, 2003 (Directorate of Traffic).

Table 4
DISTRIBUTION OF CASUALTIES BY DRIVING LICENSE TYPE

Driving license type		Casualties	Distribution (%)
A	General	1,795	16.50
	Common	734	6.80
BI	General	1,355	12.50
	Common	1,289	11.90
BII	General	499	4.60
	Common	776	7.10
C		4,412	40.60
Total		**10,860**	**100**

Source: National Police Department RI, 2003 (Directorate of Traffic).

Table 5
CASUALTIES BY EDUCATION LEVEL 2002

Education level	Casualties	Distribution (%)
Elementary School	2,160	16.4
Junior High School	4,236	32.2
Senior High School	5,738	43.6
University	1,036	7.9
Total	**13,170**	**100.0**

Source: National Police Department RI, 2003 (Directorate of Traffic).

Table 6
NUMBER OF MOTOR VEHICLE INVOLVED IN
ROAD ACCIDENT, 2002

Type of motor vehicles	Number	Distribution (%)
Car	4,360	24.3
Truck	3,883	21.6
Bus	1,214	6.8
Motorcycle	8,518	47.4
TOTAL	17,975	100.0

Source: National Police Department RI, 2003 (Directorate of Traffic).

Table 7
GENERAL AND TRANSPORT STATISTICS OF INDONESIA

Profile	2001	2002	Change (%)
Land area (Km2)	1,919,317		
Total road length (Km)	418,179	427,379	2.2
National road**	26,294.44	26,271.03	
Provincial road**	37,596.19	38,913.56	
District road**	n.a	240,690.12	
Municipality road**	n.a	21,863.00	
Highway**	532.00	576.00	
Population (person)	214,673,204	217,013,142	1.09
Traffic police officer* (personnel)	22,182	24,352	9.78
Distribution to population (%)	0.0103	0.0112	0.009
Number of vehicles (unit):			
Car	3,261,807	3,862,579	18.42
Truck	1,759,747	2,015,347	14.52
Bus	687,570	731,990	6.46
Motorcycle	15,492,148	18,061,414	16.58
Registered driving license:			
A	1,201,815	1,246,028	3.59
BI	486,466	453,986	-6.68
BII	114,880	119,563	4.08
C	2,575,614	3,204,671	24.44
Casualties:			
Fatalities	9,552	8,762	-7.98
Serious Injury	6,656	6,012	-9.68
Slight Injury	9,181	8,929	-2.74
Motor vehicle involved in road accidents (unit):			Distribut. (%)
Car:			
Private	-	4,306	24.26
Passenger	-	1,654	9.20
Official	-	2,706	15.05
Truck:			
Private	-	3,883	21.60
Commercial	-	1,092	6.08
Official	-	2,791	15.53
Bus:			
Private	-	1,214	6.75
Passenger	-	1,084	6.03
Official	-	180	0.72
Motorcycle	-	8,518	47.39

Notes: * Bali, North Sumatera and South Sumatera are excluded.
      ** CBS, 2003 (National Transportation Statistics 2002).
Source: National Police Department R.I, 2003.