ADB-ASEAN Regional Road Safety Program

Accident Costing Report: AC 3

The Cost of Road Traffic Accidents in Indonesia

ADB

asean

Asian Development Bank-Association of Southeast Asian Nations Regional Road Safety Program

Accident Costing Report AC 3: Indonesia

Regional Project Team

C. Melhuish, Asian Development Bank project officer
A. Ross, road safety adviser and project leader
M. Goodge, road safety specialist

Indonesia In-country Team

H. Sutomo, Asian Development Bank in-country consultant
B. Brodjonegoro
H. Iskandar

ACKNOWLEDGMENTS

This report was prepared according to the methodology provided by the Asian Development Bank-Association of Southeast Asian Nations regional team and under its periodic guidance and advice. In preparing this report, the authors benefited from the valuable information, support, and encouragement provided by Gadjah Mada University, Center for Transportation and Logistic Studies; Indonesian National Police; Institute of Road Engineering, Bandung; Ministry of Communication, Directorate General Land Transportation; Ministry of Health; National Vehicle Insurers; and University of Indonesia, Institute for Economic and Social Research.

CONTENTS

1 INTRODUCTION

1. 1 General

The traffic accident rate in Indonesia is still considerably high, as reported by the national police, with around 60 accident casualties per day. Of reported casualties, 24 are fatalities. This figure is relatively high for the Association of Southeast Asian Nations, where a total of only about 112 people die each day from traffic accidents.

Considering that accident casualties could also occur on sea and in air transportation, the total number of accident casualties is certainly higher. According to insurance reports, about 187 transportation-related casualties are recorded each day, with 63 of these being fatalities. However, Sutomo (2000) suggests that traffic accident data are definitely underreported.

To estimate the economic cost of traffic accidents, the availability of traffic accident casualty data will be necessary. Obtaining the kind of data that could properly represent the impact of traffic accidents on national economic indicators is far from easy. According to a national police report, the total loss resulting from accidents was Rp41 billion in 2002. The estimate in this study results in a higher value than official accident cost data gathered by the police, since a different method is applied and a different number of casualties is used to obtain the actual cost.

1. 2 Background of Study

The main reason for this study is to raise the issue of traffic accidents in many dimensions. First is the human dimension. Traffic accidents are basically unexpected events that could cause many types of losses, including material, physical, and human life losses. From the economic point of view, the cost-benefit analysis is the background of this study. The analysis compares efforts to avoid or reduce traffic accidents with losses caused as a result of accidents. Hence, expenditures of government bodies and individuals in efforts to reduce accidents should be classified as economic investments that certainly have to be taken into the comprehensive calculation of the economic impacts of traffic accidents.

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

1. 3 Objectives and Scope of Works

The first objective of the study is to provide an initial estimate of traffic accident losses and use the estimate to assess the economic impacts of accidents. Since national-level data are used in the estimate, the study's final output will be in the form of accident loss in gross domestic product proportion. Police, life insurance, car insurance, and hospital and central agency of statistics data are used as sources in the study.

The second objective is to forecast the total national accident cost for the next 5 years by using the same calculation as the 2002 national accident costing method. Based on this calculation, the amount of money that would be saved by initiating a national road safety program will be made clear.

2 METHODOLOGY

2. 1 Introduction

Calculating the impact of traffic accidents in monetary terms is far from easy. First, accidents are unexpected events. Second, the value of human life and safety is almost impossible to estimate. For most people, determining a price for personal safety would be difficult. However, some approaches are used to estimate the economic impacts of traffic accidents. According to Miller (1991), two general approaches exist to quantify human safety: the human capital method and the comprehensive method. The human capital method calculates the direct cost of accidents, such as related vehicle repair costs, necessary medical treatment costs, and related loss of productivity costs. The comprehensive method basically estimates the insurance costs, which reflect the compensation for individuals who are trying to anticipate the negative impacts of accidents.

2. 2 Human Capital Method

This method combines the costs that occur during and after traffic accidents (i.e., ex ante costs). The costs consist of administrative costs, related vehicle repair costs, medical treatment costs, and present value estimates of accident victims' loss of income due to accidents. This method is also called the gross output method. To estimate the economic value of output loss, average assumption is used because accidents could take place randomly, at any income level. This approach is valid for computing aggregate costs at the national level. However, the cost of individual cases at each injury level could vary dramatically.

Considerable evidence indicates that the most serious injuries are not adequately covered by insurance. Depending on the financial ability and insurance coverage of individual casualties, the accident cost could be as catastrophic to an injured person's economic well-being as to that person's physical and emotional condition.

2. 3 Casualty Severity Classification

This study classifies casualty severity based on Law 14, which was enacted in 1990. Casualty severity is classified in the following ways.

(i) **Fatal.** This means that a person died from injuries sustained in a transport-related accident within 30 days of that accident.

(ii) **Seriously injured.** This means that a person is admitted to a hospital as a result of injuries from a transport-related accident and receives treatment for more than 30 days.

(iii) **Slightly injured.** This means that a person is admitted to a hospital because of injuries resulting from a transport-related accident and receives treatment for less than 30 days.

Classifying casualties using the number of hospitalized days does not always represent the actual severity of injuries. However, since using the abbreviated injury scale is still uncommon in Indonesia, due to data inadequacy, a classification system using the number of hospitalized days would be easier to apply for research and studies on road accidents.

2. 4 Number of Casualties

Under the current system, because of the different agencies and different jurisdictions involved, a serious problem exists regarding the underreporting of traffic accidents by the police. An efficient road accident data system is simply not yet available in Indonesia. Moreover, hospital and insurance records are not reconciled with those of the police. Be that as it may, the Ministry of Health recorded the number of fatalities as 30,464 in 2002. This would be the base value for assuming the number of injury cases in 2002.

In line with this, a study by Mohan (2001) stated that to estimate accident casualties, a ratio of 70.0 slight injuries and 15.0 serious injuries for every death was suggested to apply to most countries. For property damage only cases, a ratio of 5.3 damage only crashes for each injury crash is applied, adopting the South Africa experience (1998). Based on the given proportions, Table 1 shows the estimated road accident casualties in Indonesia in 2002.

Table 1: Estimated Number of Casualties and Accidents

Casualty	Reported[a]	Estimated
Fatal	8,762	30,464
Seriously Injured	6,012	450,000
Slightly Injured	8,929	2,100,000
Property Damage Only	—	13,515,000
Total Casualties	**23,703**	**16,095,000**
Total Accidents	**12,267**	**13,412,500**

— = data not available.
[a] Reported by the Indonesian National Police.
Source: Indonesian National Police.

3 COST COMPONENTS

3. 1 Introduction

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

3. 2 Property Damage

Accident data that involve property damage are obtained from police and tollway management companies. The vehicle damage cost could vary, depending on the severity of the traffic accidents. Hence, obtaining the estimated cost of each level of accident severity for each traffic accident (unit cost) is crucial.

To estimate this type of cost, the field survey of car service centers will be useful in obtaining the relevant cost in repairing damaged cars, according to the severity of accidents and types of vehicles. As a result, the cost estimate will not include nonvehicle damage, such as damage to public infrastructure, which includes lampposts, guardrails, traffic signs, and road surfaces.

Another problem identified concerned different definitions of accident severity levels. In general, accident severity was measured based on the severity of accident casualties. However, for property damage, the level of severity was measured based on the severity of vehicle damage. Although these measurements might relate to each other, the reality clearly indicated that traffic accidents that caused severe vehicle damage would not always cause serious casualties, and vice versa.

Property Damage Estimate for Indonesia. Almost every accident will cause vehicle damage. Moreover, in some cases, accidents will also cause infrastructure damage involving traffic lights, electricity poles, and road markers. This means that the cost will cover vehicle and infrastructure repairs. Estimating these cost components is impossible, due to the lack of data from police. Another relevant cost related to property damage is car rental costs incurred while vehicles are being repaired. However, in Indonesia, this might not be significant.

The cost estimate of property damage could be obtained from vehicle repair centers or service stations. Another source of data and information would be car insurance companies that should provide total claims for vehicles damaged in transport-related accidents. However, in Indonesia, collecting insurance data related to road accidents is difficult. Apart from that, the data might be biased, because not all damaged vehicles are covered by insurance. Hence, data and information from repair centers or service stations should be enough to estimate the unit cost of property damage. Vehicle service centers provide the repair cost data that include machine repairing, body repair costs, spare-parts replacement costs, and other repair and maintenance costs.

Some estimates can be made when measuring the number of property damage only accidents, based on the level of severity, by making assumptions regarding the level of property damage in relation to the level of casualties. Through this assumption, experts can predict that a fatal accident can cause a fatal casualty and serious property damage. While some correlation might exist between injuries sustained and damage caused, the relationship is not always proportional. For example, in an accident involving a pedestrian, the vehicle may suffer little or no damage, but the injuries sustained can be extremely serious. Or, the opposite can happen. Serious property damage can

occur, and the injuries sustained can be slight.

Vehicle Damage Unit Cost Data. The data are obtained from surveys involving repair centers or service stations and contain only two types of vehicles: cars and motorcycles. Unit cost of car damage is assumed to represent all types of cars. The survey was carried out in Jakarta.

The amount of property damage cost by level of damage is presented in Table 2.

Table 2: Unit Cost for Property Damage

Severity	Rupiah
Fatal	8,000,000
Serious	2,500,000
Slight	850,000
Property Damage Only	500,000

Source: Indonesia data.

3. 3 Administrative Costs

In addition to property damage, traffic accidents also produce administrative costs. These costs are paid by various institutions that are related to accidents, such as police, ministries, insurers (vehicle and life), and hospitals. However, this cost estimate is sometimes ambiguous. The police, for example, have a program designed to minimize accidents through the assignment of squads, but the funding for that program is not necessarily provided to minimize the number of accidents. This result, however, might come from any other program, such as the routine management of traffic.

In any accident, the administrative costs could be linked to the severity of that accident. In a major accident, where serious motor vehicle damage has occurred, the police might have to deal with the accident directly, and after that the police might undertake a long procedure involving investigation, insurance claims, and other legal matters. This might lead to higher administrative costs. For casualties, additional administrative costs could arise, such as funeral costs for fatal casualties.

Administrative Costs Estimate for Indonesia. Administrative costs can result from the costs related to road accidents paid by institutions. In this report, four entities that have to cover this kind of cost are identified (Table 3). First, the police must cover costs related to investigations and operating costs for personnel and vehicles needed to manage safety-related activities. Second, the Ministry of Communication must cover the costs in its annual budget related to managing a road safety program. Third, insurers must cover the costs that result from the insurance claim process. And, fourth, individuals must cover funeral or burial plot costs.

Table 3: Administrative Cost Component

Entity	Identification of Administrative Cost
Police Department	Administration costs related to investigations and operating costs of personnel and vehicles
Ministry of Communication	Annual budget for traffic control or managing road safety objectives
Insurers	Administrative costs related to the claims process
Individuals	Funeral or burial plot costs

Source: Indonesia data.

The administrative cost component related to accidents covered by the police is in the form of the administrative cost of investigation. The cost is Rp5,200,000 for every major case, and Rp1,550,000 for every minor case. Based on the assumption that most cases are major cases, with a total of 12,267, the total administrative cost could reach Rp637 million in 2002. This component also includes other types of costs related to minimizing accidents, such as intersection monitoring and highway patrols. Traffic control cost is examined in Table 4.

Table 4: Traffic Control Cost of Police Department
(2002)

Cost Components	Cost per Unit (Rp)	Unit	Annual Cost (Rp)
Personnel	10,000.00 (per day)	4,943 personnel	18,041,950,000
Operating Cost of Motor Vehicles	13,140,000.00	2,471 motor vehicles	32,468,940,000
Total			**50,510,890,000**

Source: Indonesia data.

On average, the total number of police officers involved in this program is about 22% of the total police force, especially the lower-ranking officers. With the assumption that this program uses one car for every two officers, the total operating costs reached Rp50.52 billion in 2002.

The second component involves the routine costs incurred by the Ministry of Communication to minimize accidents through various activities, including road improvement projects. About Rp300 million is estimated to be spent per year. The total estimate in 2002 was about Rp6.94 billion, with the number of the casualties being 69,745.

The third component is the insurance administration cost, either vehicle insurance or life insurance. This cost component contained not only costs that are charged by insurers as administrative costs but also costs that occurred during the claims process, including telephone bills and transportation costs. For vehicle damage, the average administrative cost in processing a claim is Rp150. The average administrative cost for life insurance is less than Rp50. This information was obtained from a survey involving insurance consumers, and the survey was conducted in Jakarta. Another cost component that should be considered is funeral costs, which average about Rp300,000. Unit cost for administrative cost components for each level of severity is shown in Table 5.

Table 5: Administrative Cost Unit
(Rp)

Administrative Cost Component	Fatal	Serious	Slight	Property Damage Only
Police Annual Operating Cost	3,138	3,138	3,138	3,138
Police Administrative Cost	52,000	52,000	15,500	15,500
Ministry of Communication Annual Operating Cost	19	19	19	19
Life Insurance	50,000			
Vehicle Insurance	150,000	150,000	150,000	150,000
Burial Plot	300,000			
Total	**555,157**	**205,157**	**168,657**	**168,657**

Source: Indonesia data.

3. 4 Medical Costs

Medical costs can vary, depending on accident severity. The minimum cost will be the ambulance cost, if casualties are not severely injured. But if casualties are severely injured, additional costs will be added, for on-the-spot medical treatment. The costs will go even higher if casualties need further special treatment in hospitals. However, if casualties die instantly, costs usually will be lower, since covering only related funeral expenses will be necessary.

Medical Costs Estimate for Indonesia. Medical costs basically vary due to injury severity and the type of hospitals providing services. For fatal accident cases, the cost will cover the number of days hospitalized, surgery costs (if applied), checkups, medicine, and doctor services. For serious injury cases, the data and information needed are the number of ays hospitalized, checkups, and doctor services. For minor injury cases, the data should include the number of days hospitalized, treatment that is ongoing, and other related costs.

Medical Costs Identification. Data on cost for medical treatment by level of severity are required to calculate the total medical cost. Average medical costs are shown in Table 6.

Table 6: Medical Cost Components

Level of Severity	Identification of Medical Cost Components	Total Unit Cost[a]
Slightly Injured Casualty	• surgery costs about Rp2 million; • hospitalization, medicine, and treatment that is ongoing cost Rp2 million; and • ambulance service costs Rp100,000	4,100,000.00
Seriously Injured Casualty	• surgery costs about Rp6 million, • medicine and treatment that is ongoing cost Rp2 million, and • ambulance service costs Rp100,000	8,100,000.00
Fatality	• surgery costs about Rp8 million, • medicine and treatment that is ongoing cost Rp2 million, and • ambulance service costs Rp100,000	10,100,000.00

[a] Average medical costs at public hospitals in Jakarta.
Source: Indonesia data.

3. 5. Loss of Output (Income)

The loss of output (income) in the national economy could take place due to the loss of productive working time resulting from traffic accidents. The loss of productive time takes place not only at the accident scene, but also at the vehicle service station, in hospitals, during treatment that is ongoing, during physical rehabilitation, and at public courts. For a fatal accident, the loss will be caused by the lost productivity for the remaining productive years (retirement age minus the age of death). In many cases, in fact, this last component contributed most to the loss of output (income) resulting from traffic accidents.

The loss of productive time at the accident scene could also affect other people surrounding the scene, but estimating this

kind of loss is extremely difficult. Traffic congestion caused by accidents might not be produced solely by accidents themselves but could be influenced by accident locations and times.

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

For fatal accident cases, the loss of productive time is basically the number of remaining productive years, which is calculated by subtracting the retirement age from the age at death. The data on casualty age, retirement age, and average income by age must be obtained to complete the estimate. The police, at least, provide age distribution for accident casualties. Average income, which is needed to estimate the output loss, will be very crucial. Average income should consider not only casualties' ages, but also possible annual increments. The types of jobs are certainly another factor to consider. Since compiling wage data by age is difficult, this report uses the national average annual wage. Another alternative, aside from wage, is using gross domestic product per capita. Wage and gross domestic product per capita data are easily available.

Estimate of Output (Income) **Loss in Indonesia.** The cost component of fatal accident casualty cases is the loss of productivity over the remaining productive years. For injured casualties, however, the loss of productivity can be valued by the time loss needed for medical care and treatment. The estimate of this component will be based on the data regarding casualties' distribution ages, which are provided by the police. Average wage by ages for 2002 is provided by the central agency of statistics.

Lost output (income) is estimated based on average wage by age multiplied by total casualties and remaining productive years. At the time of this study, the average retirement age in Indonesia is 60 years. Below are steps followed in calculating the value.

(i) **Calculate the distribution of casualties by age.** Police data from 2002 show the distribution of casualties by age, as presented in Table 7. This proportion is for all casualties (not classified by severity). Therefore, the number of casualties is multiplied by age and 38%, which is the proportion of fatal casualties reported by the police.

Table 7: 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: Indonesian National Police.

(ii) **Calculate economic value of fatal casualties** (deaths) **by age.** The loss of productivity from fatal casualties is the value of a casualty's remaining productive age, which from the economic point of view can be valued from average wage by age. Average wage changes over time, in step with increases in what would have been the age of the deceased, if the person was still alive. The overall trend of average wage by age is one of increase over time, with the value of decreasing in the latest period.

For example, if a victim is killed in an accident and his age is 35, the total loss of productivity is the sum of income of remaining age, which is 5 productive years multiplied by an annual wage rate of 31–40, plus 10 productive years multiplied by an annual wage rate of 41–50, plus 10 productive years multiplied by an annual wage rate of 51–60. Total loss of productivity from fatalities is examined in Table 8.

Table 8: Estimated Total Loss of Productivity Caused by Fatalities
(2002)

Age	Annual Average Wage (Rp)	Distribution of Fatalities by Age (%)	Number of Fatalities	Productive Years Foregone	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**
Average					**236,077,956**

Source: Indonesia data.

(iii) **Calculate the loss of income of seriously and slightly injured casualties.** The assumption for accidents with seriously injured casualties was that the injured people must receive medical treatment for 2 months, and these 2 months are their lost productive time. For slightly injured casualties, the period of their medical treatment is assumed to be 1 month. Therefore, the monthly average wage is used and multiplied by the number of seriously and slightly injured casualties and days receiving medical care. Tables 9 and 10 show the total loss of productivity by casualties.

Table 9: Total Loss of Productivity Resulting from Seriously Injured Casualties
(2002)

Age	Average Wage (Rp)	Percent of Casualties	Number of Casualties	Period of Treatment	Lost Output (Rp)
5–15	332,909	3	13,500	2 months	8,988,543,000
16–21	332,909	26	117,000	2 months	77,900,706,000
22–30	498,357	33	148,500	2 months	148,012,029,000
31–40	624,050	23	103,500	2 months	129,178,418,310
41–50	742,121	11	49,500	2 months	73,470,028,500
51–60	669,192	4	18,000	2 months	24,090,912,000
Total Casualties			**450,000**	**Total Cost**	**461,640,636,810**
				Average	**1,538,802**

Source: Indonesia data.

Table 10: Total Loss of Productivity Resulting from Slightly Injured Casualties
(2002)

Age	Average Wage (Rp)	Percent of Casualties	Number of Casualties	Period of Treatment	Lost Output (Rp)
5–15	332,909	3	63,000	1 month	20,973,267,000
16–21	332,909	26	546,000	1 month	181,768,314,000
22–30	498,357	33	693,000	1 month	345,361,401,000
31–40	624,050	23	483,000	1 month	301,416,309,390
41–50	742,121	11	231,000	1 month	171,430,066,500
51–60	669,192	4	84,000	1 month	56,212,128,000
Total Casualties			**2,100,000**	**Total Cost**	**1,077,161,485,890.00**
				Average	**512,934.04**

Source: Indonesia data.

Another cost component, which is not included when calculating loss of productivity resulting from slight or serious injuries, is the time injured people spend searching for new jobs, when they cannot maintain their previous jobs. Moreover, productivity loss, in many instances, not only affects the injured person but also voluntary caregivers, who may be family members or relatives of the injured person. This additional loss of productivity is seldom recorded, since the total amount of time lost and the wage rate cannot be easily ascertained.

3. 6 Accident Cost Unit

To calculate the cost unit, all estimated cost components must be added, based on casualty severity. The overall estimate appears in Table 11.

Table 11: Accident Cost Unit

Cost Components	Fatality (Rp)	Serious Injury (Rp)	Slight Injury (Rp)	Property Damage Only (Rp)
Property Damage	8,000,000	2,500,000	850,000	500,000
Medical Care	11,100,000	10,000,000	4,100,000	
Administrative Cost	555,157	205,157	168,657	168,657
Lost Output	236,077,956	1,538,802	512,934	
Total Cost Unit	**255,733,113**	**14,243,959**	**5,631,591**	**668,657**

Source: Indonesia data.

3. 7 Accident Cost Unit Plus Human Cost

As well as the cost elements described previously, which would affect the casualties' well-being, another aspect that should be taken into account is the physical and emotional pain of being an accident victim. This pain, suffering, and grief due to traffic accidents need to be added to the overall crash cost estimate. Babtie Ross & Silcock stated that a previous report (by Transport Research Laboratory, 1995) recommend adding a sum of pain, suffering, and grief, of which the amount is 28% of total costs for fatal accidents, 50% of total costs for serious injury accidents, and 8% of total costs for a damage only accidents.

Based on this proportion, human costs for each casualty type are estimated at the values presented in Table 12.

Table 12: Human Cost

Item	Rupiah
28% Total Cost of Fatal Crash	71,605,272
50% Total Cost of Serious Injury Crash	7,121,980
8% Total Cost of Slight Injury Crash	450,527

Source: Indonesia data.

Table 13 adds the human costs into the overall accident cost unit.

Table 13: Accident Cost Unit by Severity
(plus human cost)

Severity	Rupiah
Fatal	327,338,385
Serious	21,365,939
Slight	6,082,118

Source: Indonesia data.

4 NATIONAL ACCIDENT COST

The national accident cost is obtained by multiplying the number of casualties and unit cost for each level of severity. Table 14 illustrates the total annual national economic loss due to road accidents.

Using the 2002 Indonesia nominal gross domestic product of Rp1,421 trillion, the total accident cost in Indonesia was estimated to be roughly Rp41 trillion (approximately US$4.5 billion) or 2.9% of the gross domestic product. This figure is relatively high, even though the human capital approach is applied.

Table 14: National Accident Cost

Severity	Number of Casualties	Cost Unit (Rp)	Total Cost (Rp)
Fatal	30,464	327,338,384	9,972,036,547,189
Serious	450,000	21,365,938	9,614,672,364,835
Slight	2,100,000	6,082,118	12,772,448,336,325
Proper Damage Only	13,515,000	668,656	9,036,898,494,305
Total			**41,396,055,742,655**
Gross Domestic Product			
Percent of Gross Domestic Product			

Source: Indonesia data.

5 SAVINGS

Based on the estimated annual accident cost in Indonesia, initiating a road safety program would be a must in tackling the recurring cost lost. An action plan is developed with the aim of reducing the number of casualties. Reducing the number of casualties will result in reducing the total accident cost. Fewer casualties mean more money will be saved. Thus, creating an action plan is an investment as well as an effort to save lives. Based on the growth of motorcycle use, the pattern of accident casualties can be predicted mathematically. Using the linear estimation method, the result is shown in Table 15.

If a safety program that has as a target a 40% reduction in the rate of annual fatal injuries and property damage only accidents until 2010 is initiated, the number of casualties will be reduced as shown in Table 16.

Table 15: Number of Casualties
(business as usual)

Year	Fatal	Injury		Total Injury	Property Damage Only
		Serious	Slight		
2005	37,019	511,637	805,100	**1,316,736**	6,978,702
2006	39,290	543,028	854,495	**1,397,523**	7,406,872
2007	41,605	575,014	904,829	**1,479,843**	7,843,168
2008	43,962	607,597	956,100	**1,563,697**	8,287,592
2009	46,363	640,775	1,008,309	**1,649,084**	8,740,143
2010	48,807	674,549	1,061,455	**1,736,004**	9,200,822

Source: Indonesia data.

Table 16: Number of Casualties
(with action plan)

Year	Fatal	Injury		Total Injury	Property Damage Only
		Serious	Slight		
2005	36,128	499,319	785,716	**1,285,035**	6,810,685
2006	37,458	517,700	814,640	**1,332,340**	7,061,402
2007	38,782	535,997	843,432	**1,379,428**	7,310,970
2008	40,100	554,220	872,107	**1,426,327**	7,559,531
2009	41,414	572,378	900,680	**1,473,058**	7,807,208
2010	42,724	590,479	929,164	**1,519,643**	8,054,111

Source: Indonesia data.

Using an inflation rate of 7% per year, the accident cost unit in 2002 is escalated to estimate the next 5-year monetary value. Table 17 illustrates the escalation.

Table 17: Escalated Accident Cost Unit
(Rp'000)

Severity	2002	2003	2004	2005	2006	2007	2008	2009	2010
Fatal	327,338	350,252	374,769	401,003	429,073	459,109	491,246	525,633	562,428
Serious	21,365	22,861	24,461	26,174	28,006	29,966	32,064	34,309	36,710
Slight	6,082	6,507	6,963	7,450	7,972	8,530	9,127	9,766	10,450
Property Damage Only	668	715	765	819	876	937	1,003	1,073	1,148

Source: Indonesia data.

The number of casualties and the unit cost for each level of severity are the parameters to estimate the cost of accidents in the future. Applying the previous computation method (2002 data), Table 18 shows the amount of money that will be lost as a result of accidents over the next 5 years.

Table 18: Yearly Accident Cost by Severity
(business as usual)
(in Rp billion)

	Severity of Accident				
Year	Fatal	Serious Injury	Slight Injury	Property Damage Only	Total
2005	14.84	13.39	5.99	5.71	39.93
2006	16.85	15.20	6.81	6.49	45.35
2007	19.10	17.23	7.71	7.35	51.39
2008	21.59	19.48	8.72	8.31	58.10
2009	24.36	21.98	9.84	9.38	65.56
2010	27.45	24.76	11.09	10.57	73.87

Source: Indonesia data.

Comparing the two conditions of road safety in Indonesia (business as usual and with action plan), one could estimate the value of money saved by the action plan by diffracting the total accident cost in business as usual with the with action plan condition. The diffraction as the value of money saved by the road safety activity equals Rp36 trillion.

6 CONCLUSION

6. 1 Constraints and Opportunities

A lack of data availability limited detailed calculation for the accident cost estimate, as the police and insurer data available could not record all casualties, and hospitals use a different severity classification.

The estimate for loss output did not cover the loss of families' (career) productivity in terms of time loss resulting from the need to care for casualties. Moreover, the productivity loss of workers who suffered permanent disabilities and therefore had to search for new jobs was not covered.

The medical cost is based on the aggregation of total days spent receiving medical treatment. Estimating the cost based on the injury sustained would be more accurate, since the given medical treatment and its cost are based on the type of injury, not the number of days spent being hospitalized.

6. 2 Concluding Remarks

This research clearly demonstrates the recurring loss due to road traffic accidents in Indonesia. With the accident cost of Rp41 trillion, or 2.9% of the gross domestic product, and around 16 million casualties, it could be concluded that road safety in Indonesia has become a severe problem that needs more attention. This relatively high percentage should push the Government to do more in investing in a road safety program. However, in a developing country such as Indonesia, inadequate fund allocation to initiate such a program has always limited efforts of this kind. If the Government can be convinced that a reduction of accidents could reduce the Rp41 trillion in unnecessary economic losses, a road safety program would be considered financially beneficial. This study resulted in an initial estimate showing that the reduction of accident cost could reach Rp36 trillion over the next 5 years by initiating a road safety action plan. However, collaboration among all related institutions is a prerequisite to ensure that a road safety action plan would be comprehensively executed. The Government, in particular, would have to be involved in this collaboration and provide all necessary resources and allocate all necessary funds for plan sustainibility.

Appendix Traffic Statistics

The following tables present various statistics related to road safety. Table A.1 shows total claims and growth of life insurance. Table A.2 shows the number of casualties. Table A.3 shows the number of casualties by casualty category. Table A.4 shows distribution of casualties by driver's license type. Table A.5 shows casualties by education level. Table A.6 shows the number of motor vehicles involved in road accidents. Table A.7 shows general and transport statistics of Indonesia.

Table A.1: Total Claims and Growth of Life Insurance
(motor vehicle passengers and drivers)

Year	Casualties	Growth (%)	Claims (Rp)	Growth (%)
1997	56,467	—	77,062,064	—
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)

— = no data available.
Note: negative numbers are enclosed in parentheses.
Source: PT Jasaraharja documents.

Table A.2: Number of Casualties
(motor vehicle passengers and drivers)

Casualties Category	2001	2002	Change (%)
Fatalities	18,120	23,503	29.7
Injured	35,435	44,035	24.3
Total	**53,555**	**67,538**	**26.1**

Source: PT Jasaraharja documents.

Table A.3: Number of Casualties by Casualty Category in Regional Police Department Records
(2002)

	Casualties							
Regional Police Department	**Total Casualties**	**National Distribu-tion (%)**	**Fatalities**	**Distribu-tion (%)**	**Serious Injury**	**Distribu-tion (%)**	**Slight Injury**	**Distribu-tion (%)**
NAD	**486**	2.1	113	23.3	157	32.3	216	44.4
SUMUT	**1,662**	7.0	544	32.7	492	29.6	626	37.7
SUMBAR	**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
KALBAR	**409**	1.7	146	35.7	68	16.6	195	47.7
SUMSEL	**684**	2.9	301	44.0	150	21.9	233	34.1
METROJAYA	**938**	4.0	262	27.9	496	52.9	180	19.2
JABAR	**2,716**	11.5	1,081	39.8	752	27.7	883	32.5
JATENG	**2,729**	11.5	908	33.3	558	20.4	1,263	46.3
JATIM	**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
KALTIM	**796**	3.4	376	47.2	208	26.1	212	26.6
KALSEL	**444**	1.9	228	51.4	75	16.9	141	31.8
SULSEL	**964**	4.1	574	59.5	226	23.4	164	17.0
SULUT	**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
KALTENG	**286**	1.2	136	47.6	85	29.7	65	22.7
SULTENG	**302**	1.3	99	32.8	77	25.5	126	41.7
SULTRA	**186**	0.8	122	65.6	37	19.9	27	14.5
NTB	**371**	1.6	204	55.0	81	21.8	86	23.2
NTT	**707**	3.0	212	30.0	190	26.9	305	43.1
DIY	**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**	**6,012**	**25.4**	**8,929**	**37.7**

Source: Directorate of Traffic, National Police Department.

Table A.4: Distribution of Casualties by Driver's License Type

Driver's License Type		Casualties	Distribution (%)
A	General	1,795	16.5
	Common	734	6.8
BI	General	1,355	12.5
	Common	1,289	11.9
BII	General	499	4.6
	Common	776	7.1
C		4,412	40.6
Total		**10,860**	**100.0**

A = license for driving passenger cars with maximum of 8 passengers, BI = license for driving trucks, buses, BII = license for driving long, articulated vehicles, tractors, trailers, C = license for riding motorcycles with engine capacity >= 50cc.
Source: Indonesia data.

Table A.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: Directorate of Traffic, National Police Department.

Table A.6: Number of Motor Vehicles Involved in Road Accidents
(2002)

Type of Motor Vehicle	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: Directorate of Traffic, National Police Department.

Table A.7: General and Transport Statistics of Indonesia

Profile	2001	2002	Change (%)
Land Area	1,919,317 km^2		
Total Road Length	418,179 km	427,379 km	2.200
National Road[a]	26,294,44 km	26,271.03 km	
Provincial Road[a]	37,596.19 km	38,913.56 km	
District Road[a]	—	240,690.12 km	
Municipal Road[a]	—	21,863.00 km	
Highway[a]	532.00 km	576.00 km	
Population	214,673,204	217,013,142	1.090
Traffic Police Officer[b]	22,182 personnel	24,352 personnel	9.780
Distribution to Population	0.0103%	0.0112%	0.009
Number of Vehicles			
Car	3,261,807 units	3,862,579 units	18.420
Truck	1,759,747 units	2,015,347 units	14.520
Bus	687,570 units	731,990 units	6.460
Motorcycle	15,492,148 units	18,061,414 units	16.580
Registered Driver's License			
A	1.201.815	1.246.028	3.590
BI	486.466	453.986	(6.680)
BII	114.880	119.563	4.080
C	2.575.614	3.204.671	24.440
Casualties			
Fatalities	9.552	8.762	(7.980)
Serious Injury	6.656	6.012	(9.680)
Slight Injury	9.181	8.929	(2.740)
Motor Vehicles Involved in Road Accidents			**Distribution**
Car (Private)	—	4.306 units	24.260
Car (Passenger)	—	1.654 units	9.200
Car (Official)	—	2.706 units	15.050
Truck (Private)	—	3.883 units	21.600
Truck (Commercial)	—	1.092 units	6.080
Truck (Official)	—	2.791 units	15.530
Bus (Private)	—	1.214 units	6.750
Bus (Passenger)	—	1.084 units	6.030
Bus (Official)	—	180 units	0.720
Motorcycle	—	8.518 units	47.390

— = no data available.
A = license for driving passenger cars with maximum of 8 passengers, BI = license for driving trucks, buses, BII = license for driving long, articulated vehicles, tractors, trailers, C = license for riding motorcycles with engine capacity >= 50ccm km = kilometer, km^2 = square kilometer.
Note: Negative numbers are enclosed in parentheses.
[a] National Transportation Statistics 2002
[b] Bali, Sumatera Utara dan Sumatera Selatan are excluded.
Source: National Police Department.

REFERENCES

Asian Development Bank. 1997. *Road Safety Guidelines for Asian and Pacific Region, Regional Initiatives in Road Safety*. Manila.

Babtie Ross Silcock and Transport Research Laboratory. 2003. *Guidelines for Estimating the Cost of Road Crashes in Developing Countries, Final Report, Department for International Development Project R7780*.

Transport Research Laboratory. Central Bureau of Statistics. 2002. *Statistic of Indonesia*. Jakarta

Miller, Ted. 1991. The Cost of Highway Crashes. *FHWA* RD-055.

Ministry of Health. 2002. *Yearbook of Ministry of Health Statistics*. Jakarta.

National Indonesian Police. 2002. *Figure of Police*. Jakarta.

Sutomo, H. 1999. Road Accidents in Indonesia. *Journal of International Association of Traffic and Safety Sciences* 23 (2): 110–113.