ADB-ASEAN Regional Road Safety Program

Accident Costing Report: AC 9

The Cost of Road Traffic Accidents in Thailand

ADB

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

Accident Costing Report AC 9: Thailand

Regional Project Team

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

Thailand In-country Team

Y. Tanaboriboon, Asian Development Bank in-country adviser

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ABBREVIATIONS

AIS	abbreviated injury scale
EMS	emergency medical service
TRL	Transport Research Laboratory

NOTE

In this report, “$” refers to US dollars.

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1 INTRODUCTION

1.1 General

Road traffic accidents in developing countries tend to be the major cause of fatalities and disabilities. In Thailand, the road traffic accident problem is now also regarded as one of the most serious social problems. According to a study conducted by the Bureau of Health Policy and Plan, Ministry of Public Health, the years of lost life of all 62 million Thais due to road accidents equaled about 600,000, making road accidents the second leading cause of death in 2000, as shown in Table 1. This could cause large-scale annual economic losses for the country.

Table 1: Years of Lost Life from 10 Leading Causes of Death
(all ages, 2000)

Cause of Death	Total	
	Years of Lost Life	Percentage of All Deaths
HIV/AIDS[a]	1,481,685	23.9
Road Accidents	**593,263**	**9.6**
Paralysis	289,517	4.7
Liver Cancer	280,771	4.5
Suicide	210,235	3.4
Injured by Others	202,478	3.3
Other Infections	190,281	3.1
Diabetes	185,904	3.0
Drowning	162,410	2.6
Ischemic Heart	161,893	2.6

[a] HIV/AIDS = human immunodeficiency virus/acquired immunodeficiency syndrome.
Source: Bureau of Health Policy and Plan 2001.

The attempts to reduce the number of fatalities and disabilities resulting from road crashes in Thailand have yet to achieve a satisfactory outcome, as road safety-related problems still remain a threat to the country overall. One way to achieve sustainable solutions for road safety is to examine the costs of road accidents. Transport Research Laboratory (TRL) describes several needs related to estimating road accident costs in developing countries. Accident costs are generally used to justify more resources for promoting and implementing road safety programs, to evaluate the proposed safety regulations and persuade policy makers that road safety schemes are beneficial (Jacobs 1995 and Jacobs et al. 2000).

1.2 Problem Statement

Over the past few decades, little effort has been made in Thailand to assess the costs of road accidents, owing to the lack of systematic accident data and/or information. Various questions often arise when road safety strategies are proposed to address the road accident situation in Thailand (e.g., the necessity of the proposed safety programs). One alternative in dealing with these inquiries is to consider the costs of these accidents.

Therefore, examining the costs of road accidents is important, as is using data as a basis or tool to tackle road accident problems.

1.3 Objectives and Scope of the Study

The objectives of this study are to estimate the costs of road crashes and casualties and assess Thailand's annual economic losses. This study attempts to provide rationalized information on the most current and comprehensive road accident costs, based on reliable and available sources. Information and data on road accident statistics and all associated cost elements in 2002 are employed in this study.

1.4 Outline of Report

This report is organized into five chapters. Chapter 1 provides the background, the problem of present practice, and the objectives and scope of this study. Chapter 2 describes the methodology used to determine the cost of road accidents together with the accident data sources acquired by this study. Chapter 3 discusses the details of cost components. Chapter 4 analyzes and clarifies the national casualties and economic losses resulting from road accidents in Thailand. Chapter 5 offers conclusions.

2 METHODOLOGY

2.1 General

To determine the costs of road traffic accidents, several practical techniques are available. For instance, TRL discussed the gross output or human capital method, net output method, life-insurance method, court award method, implicit public sector valuation method, and value of risk change or willingness to pay method. Nevertheless, no single costing method is believed to be an ideal method to use, and a considerable amount of data still needs to be collected, regardless of the method used (Jacobs 1995).

Actually, one of the most widely known methods used to estimate accident costs in developing countries, which is very well documented in the *Guidelines for Estimating the Cost of Road Crashes in Developing Countries* (Babtie Ross & Silcock 2003) is the human capital method. Thus, this method is employed to estimate accident costs in this study.

2.2 Human Capital Method

The key concept of the conservative human capital or gross output method entails the estimation of direct and indirect costs incurred to individuals and the society as a whole. The costs of a traffic accident are divided into two main categories: (i) the costs due to the loss of current resources, including the costs of vehicle damage, medical treatment, and administrative costs, and (ii) the costs due to the loss of future resources that the victim would have lived to earn, which must be discounted back, to give present values (Jacobs 1995).

According to the human capital method, six cost components, including hospital and medical cost, output lost, property damage cost, insurance administrative cost, emergency medical service cost, and human cost, are all considered to determine economic losses.

Data required for this technique are inputs for the six cost components. The accident costs can be derived by using accident severity data obtained from the Ministry of Public Health and the Royal Thai Police. Accident severity is classified as fatal, seriously injured, slightly injured, or property damage only.

2.3 Data Sources

Two main categories of data exist: road accident data and unit cost data. The following are the sources of these data.

(i) Road accident data, which are classified into four degrees of severity (fatal, serious, slight, and property damage only accidents), were obtained from the Royal Thai Police, while the number of casualties, which are classified into three degrees of severities (fatality, serious injury, and slight injury), were acquired from the Ministry of Public Health.

(ii) Unit cost data consist of six components, as presented in Table 2.

Table 2: Summary of Data Requirements and Sources of Each Cost Component

Cost Components	Data Requirements	Data Sources
Hospital and Medical Costs	▪ Average hospital and medical expenditure (in- and outpatients)	▪ Hospital and medical records from hospital
Loss of Output	▪ For fatal casualties—average fatal age, average age of retirement, and average national income statistics ▪ For serious and slight casualties—time lost for rehabilitation	▪ Ministry of Public Health ▪ Hospital and medical records from hospital ▪ National Statistical Office
Property Damage Cost	▪ Vehicle damage cost ▪ Street furniture damage cost	▪ Royal Thai Police ▪ Department of Highways
Insurance Administrative Cost	▪ Accident investigation and claim overhead	▪ Insurance companies
Emergency Medical Service (EMS) Cost	▪ EMS and rescue team operating and overhead costs	▪ Khon Kaen Regional Hospital's EMS Center
Human Cost	▪ Transport Research Laboratory's estimated proportion of the total costs	▪ Transport Research Laboratory

Source: Thailand data.

3 COST COMPONENTS

3.1 General

This chapter describes how the six cost components employed in the human capital method are estimated in this study.

3.2 Hospital and Medical Costs

Hospital and medical costs resulting from traffic accidents arise from in-hospital patient services (which include the costs of operations, X rays, medicines, doctor services, and food and bed); outpatient services; rehabilitation costs; prosthetic costs; and funeral costs. At-scene care and transport costs for patients, however, are excluded from this cost component, as these costs are covered in the emergency medical service (EMS) cost component.

Total costs of all medical treatment can be separated into those provided by hospitals and those provided by medical centers. In fact, information on the total number of hospital beds or total number of injuries in a country are available in the published statistics, and the average costs per bed or per casualty can be easily determined from such statistics.

3.3 Abbreviated Injury Scale

Several hospitals assess the costs of medical treatment, especially for nonfatal injuries, based on various categories that depend on the level of injury severity according to the abbreviated injury scale (AIS). The AIS is a classification system for assessing crash injury severity. The scale was first developed and published by the American Association for Automotive Medicine in 1969 (TRAUMA.ORG Ltd. 2003 and National Highway Transport Administration 2002).

AIS codes, which normally range from AIS-1 (minor injury) to AIS-6 (fatal injury), are primarily oriented toward the immediate risk to life resulting from injury and are estimated soon after an accident occurs. The use of AIS data could improve the accuracy of economic cost estimation and the relative number of injuries regarded as serious or slight.

3.4 Estimation of Accident Costs

The injury surveillance program was developed for public hospitals in Thailand, to maintain their trauma and injury records. The developed injury surveillance program can be further used as a road traffic accident database. For instance, the trauma registry management system of the Khon Kaen Regional Hospital, one of the well-documented medical centers in Thailand, has been using the injury surveillance program to further develop its own accident database system since 1989 (Ruengsorn et al 2002). In fact, its accident database system is widely known in Thailand because of its creative development and groundbreaking effort to employ advanced technological tools, such as the geographic information system, in developing the database system. Khon Kaen Regional Hospital is now considered a prototype for other hospitals in the country that are developing their own database systems.

In this study, the hospital and medical costs data of all road accident victims in 2002 were also obtained from the comprehensive and reliable injury surveillance database system of Khon Kaen Regional Hospital. Road accident victims are classified according to the AIS.

The hospital and medical costs, which exclude at-scene care and transport costs, are considered direct costs to road accident casualties. In this study, the costs are listed in accordance with the level of injury severity (fatal, seriously injured, or slightly injured).

For fatalities, the average cost that each patient spent while being hospitalized prior to death was estimated at B34,415 per case. Along with the funeral cost of B15,000, according to the Protection for Car Accident Victims Act 1992 (Ministry of Finance 1992), the total hospital and medical costs for each fatal casualty were accumulated to B49,415 per fatality.

The medical costs per seriously injured casualty amounted to B23,666 per case. This figure was derived from the average cost of B23,127 spent by each accident victim who stayed in a hospital for medical treatment and the average cost of B538 spent for outpatient treatment. Since only the outpatient treatment cost was considered for slightly injured casualties, the medical cost for any slight or minor casualty was estimated at B538 per case.

3.5 Lost Output

Lost output is the loss of productivity from those affected by road accidents. The main data required for lost output estimation are the average wages of the casualties and care givers and the amount of time lost due to road accidents. This amount of time lost is based either on the years that road accident fatalities could have spent working in the future, had they not died in road accidents, or the days lost that would have been spent working in the future by accident-injured victims, had they not been disabled or recovering in a hospital or at home, together with the days lost while visiting doctors (in the case of seriously or slightly injured accident victims). Accordingly, these costs can be varied from as little as 1 day lost, for a slightly injured casualty, to several years lost, for fatally injured or permanently disabled victims.

The costs of lives lost in future years of road accident fatalities must be discounted, as do the costs of days lost in treatment and rehabilitation of injured victims. These costs must be discounted to present values by applying the discount rate used and/or recommended by economists and planners in Thailand. The discount rate used in this study is 6.75% for 2002.

3.6 Estimation of Total Loss Due to Road Accidents

To estimate the total loss in future years of any road accident fatality, the average years lost and the average income earned by the road accident victim are taken into account. The number of years lost can be derived by subtracting the average age of the fatalities from their average retirement age.

As revealed in *Accident and Disaster Statistics in Thailand* (Ministry of Public Health, 2001), and as shown in Table 3, the average age of Thai road accident fatalities in 2001 was 31.7 years, whereas the average retirement age of Thai people is 60.0 years.

Since no national statistics on the average income of road fatalities are available, the most common alternative used to estimate the income of road accident fatalities is the national average net income per capita. According to the National Statistical Office (2003), and as shown in Table 4, the net income per capita in 2002 was B84,877, while the average fatal age of victims, as mentioned earlier, was 31.7 years. By using the discount rate of 6.75%, in accordance with the prime interest rates in Thailand, which ranged between 6.5% and 7.0% in 2002 (Bank of Thailand, 2003b), plus with the income growth rate of 6.0% obtained from the gross domestic product growth rate, which ranged between 5.5–6.5% per year in 2002 (Bank of Thailand 2003), the total loss of each road accident fatality is estimated to be B2,149,080 for 2002. Additionally, the estimated hospitalization costs prior to death of B6,530 per person were also considered. Thus, the total loss of each fatality is estimated at B2,155,610 per victim.

Table 3: Number of Fatalities in 2001
(classified by age group)

Group (years of age)	Number of Fatalities	Distribution of Fatalities (%)
< 1–4	208	1.63
5–9	226	1.78
10–14	339	2.66
15–19	1,607	12.63
20–24	1,801	14.16
25–29	1,562	12.28
30–34	1,417	11.14
35–39	1,295	10.18
40–44	1,054	8.28
45–49	898	7.06
50–54	637	5.01
55–59	460	3.62
60–64	444	3.49
65 – 69	335	2.63
70–74	199	1.56
> 75	231	1.82
Unknown	9	0.07
Total	**12,722**	**100.00**

< = less than, > = greater than.
Source: Ministry of Public Health.

Table 4: National Average Net Income per Capita

Year	Per Capita National Income (B)	Gross Domestic Product at Current Market Price (B million)
1999	74,946	4,637.1
2000	78,782	4,916.5
2001	81,435	5,123.4
2002	84,877	5,430.5

Source: National Statistical Office.

However, the lost output for a seriously injured victim can be derived from the average number of working days lost while being hospitalized and also the recovering period at home. Using the Khon Kaen Regional Hospital as an example, road accident statistics in 2002 revealed that the average working time lost by a seriously injured victim and a slightly injured victim was 30 days and 2 days, respectively. Assuming that the average wage rate in Thailand in 2002 was B326 per day, the average loss was B19,587 per seriously injured victim and B1,306 per slightly injured victim .

3.7 Property Damage Costs

Property damage cost estimated in this study is composed of two components: the cost of vehicle damage and the cost of public roadside property damages.

Due to the limited amount of information available from other sources, the cost of vehicle damage resulting from road accidents used in this study was obtained from Royal Thai Police (2003) records. Of the 91,623 road traffic accidents in 2002, the average cost of vehicle damage in Thailand was B16,316 per accident, which applies only to the cost of vehicle damage resulting from accidents in which the victims were slightly injured.

The cost of public roadside property or furniture damage was acquired from the Department of Highways. Among all 5,063 accidents that occurred along national highways, the Department of Highways reported that the total costs of public roadside property and furniture damage amounted to B84.73 million in 2002. This implies that the average public roadside property or furniture damage cost was B16,734 per slightly injured accident.

Given the information presented, the average property damage cost can be calculated by adding the two cost components, with the corresponding adjustment factors for fatal, seriously injured, slightly injured, and property damage only accidents. Eventually, the costs of property damage was calculated at B126,583 for a fatal accident, B55,194 for an accident resulting in serious injury, B33,051 for an accident resulting in slight injury, and B18,508 for a noncasualty or property damage only accident.

3.8 Administrative Costs

In any road traffic accident, administrative costs mostly include those associated with the administration of police services, court proceedings, insurance, rescue team and medical services, and others. However, in this study, only the insurance administrative costs and EMS costs are considered as administrative costs of road traffic accidents.

The insurance administrative costs are those associated with processing and handling insurance claims. According to an insurance industry survey, the average cost of insurance staff member time for claims is B1,200 per accident case (Ministry of Finance, Thailand 1992). This study assumes that all accidents claim their damages as a result of the compulsory car insurance policy under the Protection of Car Accident Victims Act, B.E. 2535 (1992).

EMS costs are those associated with emergency medical services and cover the labor cost (wage and overtime of rescue team and staff members); material cost (office materials, medicines and medical supplies, and fuel and maintenance costs); and capital cost (command control center, vehicle parking and garage, EMS room, and ambulances and tools and durable articles) as well as overhead cost. A recent study on the Khon Kaen EMS Center, conducted in 2002, concludes that an average at-scene accident unit

cost of EMS administration, which covers all elements mentioned, was B1,975 per accident (Danaitantrakool 2003). Summing up the two main cost components, the estimated administrative cost for road traffic accidents would be B3,175 per case.

3.9 Human Costs

All casualties in road accidents would suffer from the physical and emotional pain related to being accident victims, and often their families and friends also share such suffering. When accidents occur, not only are the victims and their families affected, but the society as a whole also experiences economic, functional, and behavioral impacts. To compensate for the social loss resulting from road accidents in estimating accident costs, the human costs that account for pain, grief, and suffering were usually added to the total accident unit costs for each severity type of accident. To determine the associated pain, grief, and suffering costs resulting from road accidents, this study adopts the proportion of the total accident costs method, which was recommended by TRL (Babtie Ross & Silcock 2003) and is calculated as follows: 20% of total costs for a fatal accident, 50% of total costs for an accident resulting in serious injury, and 1% of total costs for an accident resulting in slight injury.

Based on the percentages of total costs, the costs of pain, grief, and suffering (or the human costs) for each casualty type are estimated at B536,038 for a fatally injured victim, B53,656 for a seriously injured victim, and B379 for a slightly injured victim.

4 NATIONAL ACCIDENT COSTS

Once the road accident unit cost is calculated, the total number of accidents and casualties classified by types of accident severities would be taken into consideration to derive the national economic loss resulting from road traffic accidents.

4.1 National Casualties and Accident Estimation

Prior to determining the national economic loss, obtaining the number of casualties and accident cases is essential. The number of fatalities is obtained from police statistics, while the hospital statistics on the numbers of inpatients and outpatients are used to represent the number of serious and slight injuries, respectively, as the police records on accident injuries appear to be underreported when compared with hospital statistics. According to 2002 statistics, 13,116 road accident fatalities occurred, and the numbers of serious and slight injuries acquired from the Ministry of Public Health were 190,322 serious injuries and 1,338,712 slight injuries, respectively.

As obtaining the complete figures on accident cases directly from any available statistical sources in Thailand is impossible, this study first needs to estimate the average number of casualties per accident by type of severity, and then use these estimated averages to determine the number of accident cases by each type of severity.

To obtain the average number of casualties per accident, this study used nearly 2 years of records of accident cases reported by the Khon Kaen police station. Data were collected manually, by examining all police logbooks, case by case, from 1 January 2002 to 23 November 2003. A later conclusion was that for a fatality case, for example, the average number of casualties per accident was 1.16. The other average casualties are summarized in Table 5.

Table 5: Average Number of Casualties per Road Accident
(by severity)

Accident Severity	Number of Casualties per Accident			
	Fatalities	Serious Injuries	Slight Injuries	Total Casualties
Fatal	1.16	0.48	0.43	2.07
Serious		1.25	0.41	1.66
Slight			1.72	1.72

Source: Khon Kaen Police Station Survey.

Assuming that these average casualties per accident can represent the entire nation, the total numbers of fatal injuries, serious injuries, and slight injuries in accident cases for the country were 11,307 cases, 147,916 cases, and 740,235 cases, respectively.

To estimate the number of property damage only cases, this study adopted the proportion between property damage only accidents and injury accidents by assuming that 1.32 property damage only cases occurred for every injury accident case. Thus, the number of property damage only accidents totals 1,172,359 cases.

It should be noted that the proportion between property damage only cases and the number of injury cases seems to be arbitrary and varies considerably among different studies. Jacobs 1995) recommended approximately 6.0 property damage only cases for each injury in urban areas and 4.5 property damage only cases for each injury in rural areas in the United Kingdom. Meanwhile, Babtie Ross & Silcock (2003) recommended 5.3 property damage only cases for each injury in South Africa. The value of 1.32 property damage only cases for each injury used in this study is obtained from a previous study conducted in Thailand by Khomnamool (1979).

4.2 The Calculation of National Annual Accident Costs

After estimating the numbers of casualties and accidents by severity, the total national costs of crashes can be determined by including all six components of costs, as mentioned earlier. The summary of costs per casualty or per accident is illustrated in Table 6.

Using the previously mentioned associated costs, the average cost for all types of severities can be determined as follows: B2,852,924 per fatality, B142,273 per serious injury, B21,162 per slight injury, and B19,708 per property damage only accident.

Once the average cost per accident is estimated, then by multiplying the number of casualties, the total annual national economic loss due to road accidents can be determined, as illustrated in Table 7.

Table 6: Summary of Costs per Casualty or per Accident Type
(B)

Cost Component	Fatal Injury	Serious Injury	Slight Injury	Property Damage Only
Per Casualty				
Hospital and Medical Costs	49,415	23,666	538	—
Lost Output	2,155,611	19,587	1,306	—
Human Cost	536,038	53,656	379	—
Total	**2,741,064**	**96,909**	**2,223**	—
Per Accident				
Property Damage Cost	126,583	55,194	33,051	18,508
Insurance, Administrative Cost	1,200	1,200	1,200	1,200
Emergency Medical Service Cost	1,975	1,975	—	—
Total	**129,758**	**58,369**	**34,251**	**19,708**

— = no data available.
Source: Thailand data.

Table 7: National Cost of Road Accidents in Thailand
(2002)

Type of Casualty	Number of Casualties	Average Cost (B)	Total Cost (B million)
Fatal	13,116	2,852,924	37,419
Serious	190,322	142,273	27,078
Slight	1,338,712	21,162	28,330
All	1,542,150	—	92,827
Property damage only accident	1,172,359	19,708	23,105
Total	**—**	**—**	**115,932**

— = no data available.
Source: Thailand data.

5 CONCLUSION

This study contends that the national economic losses resulting from road accidents in Thailand are considerably high, even if the conservative human capital method is employed in estimating. As presented, in 2002, the total national economic loss resulting from road accidents is estimated at B115,932 million, or approximately 2.13% of the gross domestic product.

Based on this estimated annual road accident cost, it can be said that road accidents, one of the most severe health problems in Thailand, do not cause only losses in lives of productive members of the population and a substantial number of disabilities and injuries but also generate a gigantic loss to the country's economy. Is it timely to urge all agencies concerned to put forward more efforts, as well as sufficient manpower and other resources, to effectively address the road traffic accident problems? The question remains whether the presented estimated losses resulting from road accidents are convincing enough to persuade policy makers to seriously begin implementing road safety programs for the benefit of the society as a whole. This study firmly believes that economists as well as lay people realize how serious accident losses are for the Thai society. A duty of all parties concerned is therefore to use these estimates to persuade the Government to (i) play a more active, if not proactive, role in promoting road safety and (ii) allocate sufficient resources, particularly financial resources, to help alleviate this severe health problem in our country.

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