



# Road Safety Investment: A Step to Achieve the Decade of Action on Road Safety Goal in Thailand

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## บทคัดย่อ

**วัตถุประสงค์:** การศึกษาครั้งนี้จัดทำเพื่อเป็นชี้แจงวัตถุประสงค์ในการประเมินที่ภาครัฐลงทุนในโครงการและมาตรการต่างๆ ที่เกี่ยวข้องกับอุบัติเหตุบนถนนระหว่าง พ.ศ. 2550 - 2554 โดยได้จำแนกงบประมาณตามยุทธศาสตร์ 5-Es ที่เป็นยุทธศาสตร์สำคัญนำไปสู่เป้าหมายทั่วราชอาณาจักร ความปลอดภัย โดยยุทธศาสตร์ 5-Es ประกอบไปด้วย มาตรการด้านการให้การศึกษา มาตรการทางวิศวกรรม มาตรการการบังคับใช้ มาตรการที่เกี่ยวข้องกับการประเมินและระบบข้อมูล และ มาตรการแพทย์ฉุกเฉิน

**วิธีการศึกษา:** วิธีการศึกษาครั้งนี้คือ การทบทวนวรรณกรรมอย่างเป็นระบบจากเอกสารงบประมาณจาก 5 หน่วยงานภาครัฐและ 2 กองทุนที่ทำงานเกี่ยวข้องกับมาตรการอุบัติเหตุระหว่าง พ.ศ. 2550 - 2554 โดย

งบประมาณตามแผนงานหรือโครงการต่างๆ ที่ระบุไว้ในเอกสารงบประมาณจะถูกจำแนกเป็น 5 ยุทธศาสตร์โดยนักวิจัยในโครงการ 2 คน แบบสอบถามจะถูกส่งไปท่องทุนเพื่อให้ระบุงบประมาณตาม 5 ยุทธศาสตร์ การล้มภาษณ์เชิงลึกจะใช้ประกอบการพิจารณาในมุมมองของผู้เชี่ยวชาญพิเศษแต่ละด้าน และผู้กำหนดนโยบาย

**ผลการศึกษา:** ในช่วง 5 ปีที่ผ่านมา ประเทศไทยใช้เงินประมาณ 89 พันล้านในแผนงานและโครงการที่เกี่ยวข้องกับอุบัติเหตุ โดยกว่าร้อยละ 50 ของงบประมาณทั้งหมดเป็นงานทางด้านวิศวกรรม ร้อยละ 23 เป็นงานทางด้านการบังคับใช้กฎหมาย ร้อยละ 12 เป็นในส่วนของการแพทย์ฉุกเฉิน ร้อยละ 8 คือ การประเมินและระบบข้อมูล และที่น้อยที่สุดคือ ส่วนที่เกี่ยวข้องกับการให้ความรู้และการศึกษา ร้อยละ 7 ผู้เชี่ยวชาญด้านความปลอดภัยจากอุบัติเหตุและผู้กำหนด

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นโยบายมีความคิดเห็นที่ตรงกันว่า การไม่มีระบบบูรณาการข้อมูลด้านอุบัติเหตุของประเทศไทย เป็นอุปสรรคที่สำคัญมากต่อการไม่บรรลุเป้าหมายที่ควรจะความปลอดภัย

**สรุปผลการศึกษา:** จากการที่ไม่มีข้อมูลที่เพียงพอต่อการวัดผลของมาตรการต่างๆ ทางด้านอุบัติเหตุบนท้องถนน ทำให้งานศึกษาครั้งนี้ไม่สามารถสรุปได้ว่าประเทศไทยลงทุนเพื่อป้องกันและลดปัญหาอุบัติเหตุมากไปหรือน้อยเกินไป ทั้งนี้ เมื่อเปรียบเทียบกับหลายๆ ประเทศที่พัฒนาแล้วพบว่า การลงทุนในงานด้านอุบัติเหตุของประเทศไทย ยังน้อยกว่าประเทศอื่นๆ มาก การจัดการข้อมูลที่เกี่ยวข้องกับอุบัติเหตุบนถนน และงานศึกษาที่บ่งชี้ถึงต้นทุนและผลประโยชน์หรือประสิทธิผลของแต่ละมาตรการหรือแต่ละโครงการที่ได้ลงทุนไป เป็นข้อมูลที่สำคัญยิ่งต่อความสำเร็จของการจัดการปัญหารถืองนี่ในอนาคต

**คำสำคัญ:** ความปลอดภัยบนถนนในประเทศไทย/งบประมาณภาครัฐ/การลงทุนในอุบัติเหตุบนถนน/อุบัติเหตุบนถนน/การลงทุนของประเทศไทย

## Abstract

**Objective:** To quantify the public investments on road safety in Thailand from 2007 to 2011 by the five strategies (education, engineering, enforcement, evaluation and emergency medical service) recommended to be the most important keys for achieving the decade of road safety goal.

**Methods:** The government budget documents of 2007 to 2011 were reviewed. Five ministries and two public funds were identified as having budget related to road safety goal. Each budget line from the five ministries was classified into investment in any of the five strategies. The public funds participated in the questionnaire survey giving details of spending to the five strategies over the five-year period. In-depth interviews were used in situations where opinions of either policy makers or a group of experts were needed.

**Findings:** Over five years, the investment in road safety was 89 billion baht in nominal term. Half of this was used in engineering strategy, 23% to enforcement, 12% to emergency medical service,

8% to evaluation and 7% to education. Policy makers and road safety experts agreed that lack of data and information in Thailand was one of the main obstacles to achieve the road safety goal in the near future.

**Conclusion:** Since there are insufficient data and evidences to determine the consequences of road safety policy and programs, it is not clear to conclude that Thailand has inadequately invested in road safety programs. However, the evidence confirms a low investment in road safety interventions comparing with developed countries. Systematic data management and research on cost-effectiveness are required to fulfill the information and knowledge gaps.

**Keywords:** Thai road safety/Government budget/Road safety investment/Road accident/Thailand investment

## 1. Introduction

While Thailand has enjoyed rapid economic development for several decades, the inevitable negative consequences of higher motorization level and increased complexity in traffic patterns (such as a higher share of vulnerable road users and vehicles) have resulted in aggravating road crash problems causing serious public health problems in this country. Over the past decade, road crashes have killed approximately 150,000 people (Bureau of Non Communication Disease, 2011) hence the second cause of death in the country (see table 1). The losses of human lives and ability to work have caused substantial damage to the economy. It was estimated to be 232 billion Baht (approximately US\$ 8 billion), or 2.8 percent of Thai GDP in 2007 (Taneerananon, 2008) comparing with the estimates of national economic loss due to road traffic injuries of 1% to 2% (Jacobs and Aeron-Thomas, 2002). Thailand has suffered higher than the average.

**Table 1** Disease Burden (Disability Adjusted Life Years lost) for 5 Leading Causes

Rank	Disease or Injury	2003 (%)	1999 (%)
1	HIV/AIDS	9.4	10.4
2	Road traffic injuries	7.1	6.6
3	Stroke	6.5	5.8
4	Diabetes	4.5	4.6
5	Liver cancer	4.1	3.8

**Source:** International Health Policy Program Thailand, Ministry of Public Health

In 2011, the Decade of Action on Road Safety (2011 - 2020) was launched in more than 100 countries including Thailand (World Health Organization, 2011), with one goal: to prevent five million road traffic deaths globally by 2020 (Tanaboriboon and Satiennam, 2005). Thai government has set the goal to reduce the number of deaths resulting from road crashes to less than 10 deaths per 100,000 populations by 2020. The effort covers the framework suggested by United Nations which includes the 5-E strategy: building management capacity (evaluation), influence road design and network management, influence vehicle safety design (engineering), influence road user behaviour (education, enforcement), and improve post crash care (emergency medical service). These 5 strategies have actively engaged in all aspects of road safety topics including road safety management, safer roads and mobility, safer vehicles, safer road users and post-crash response (World Health Organization, 2011). The Department of Transport, South Africa, has developed the road safety plan using the concept of road safety prevention by applying the strategies of education, enforcement, engineer and enforcement (ArriveAlive, 2011). Although focus on "enforcement", "education" and "evaluation" were counted to be supportive factors.

Thai government has realized that road crash is a serious health, economic and social problems

and started to address this serious issue since 2003 (Tanaboriboon, 2005). Based on the severity of the problem and a higher rate of return from public investments in preventing road crash, Thailand should observe substantial amount of resources allocated towards road safety. However, Thailand road safety budget does not show the significant upward trend as we expected. The private participation role was also expected but the magnitude should be out-shadowed by public investment. This paper would like to review road crash situations in Thailand and highlights the issues of public investment in road safety interventions into the 5-E strategy from 2007 to 2011 with the implications of road safety goal achievement in Thailand by 2020.

## 2. Methods

The government budget documentary reviews and the classification of budget into the 5-E strategy by the research team were the main research methods used. This study was complemented with questionnaire survey to public and private funds for road safety and in-depth interviews with key informants in academic and implementing agencies.

### 2.1 Documentary Reviews

The documentary reviews gave the overview on the road crash problems and the responses by public interventions, more importantly, budget used for those interventions. Literature on

road safety from public sector related to the 5-E strategy including Bureau of the Budget, Ministries of Transport, Education, Public Health, the Royal Thai Police, Thai Health Promotion Foundation and Road Safety Fund was retrieved.

## 2.2 Classification of Budget into the 5-E Strategy

Two researchers (Pudtan Phanthunane and Jirakom Siririsakulchai) were standardized to take the task of classifying budget lines from the retrieved budget documents published by Bureau of the Budget into the 5-E strategy. After two rounds of standardization, 59 budget lines (activities corresponding to road safety prevention) from all of the relevant public organizations were independently categorized by the two researchers. From 59 activities, only 6 items were classified as unidentifiable by both researchers. The Kappa analysis was used to check the consistency of classification, and interviews with the government officers from each concerning agency was to check for accuracy. After reaching almost perfect agreement (see appendix for the results), the first half of the budget lines were classified by PP and the second half by JS.

## 2.3 Questionnaire Survey

To collect data from Thai Health Promotion Foundation and Road Safety Fund, a structured questionnaire was sent to those public funds. We asked the organizations to report the projects aiming to reducing road crashes (from 2006 - 2010) to us and then classified into the 5-E strategy. Mainly we haven't changed the categories the organizations identified initially: however, we added some other relevant strategies when we found at least one of the projects' objectives corresponding to them. A project can have more than 1 relating strategies.

## 2.4 In-depth Interviews

Interviews were conducted with road safety policy-analysts who were representative in 4 ministries (Transport, Interior, Public Health, and Education), Royal Thai Police, and two public funds. We also focus on the three provinces (Phitsanulok, Phuket and Khon Kaen) as the study cases for more details on practitioner level. In all related agencies, informants were asked about the road safety related works and problems, budgeting issues and future directions of policy concerns.

## 3. Findings

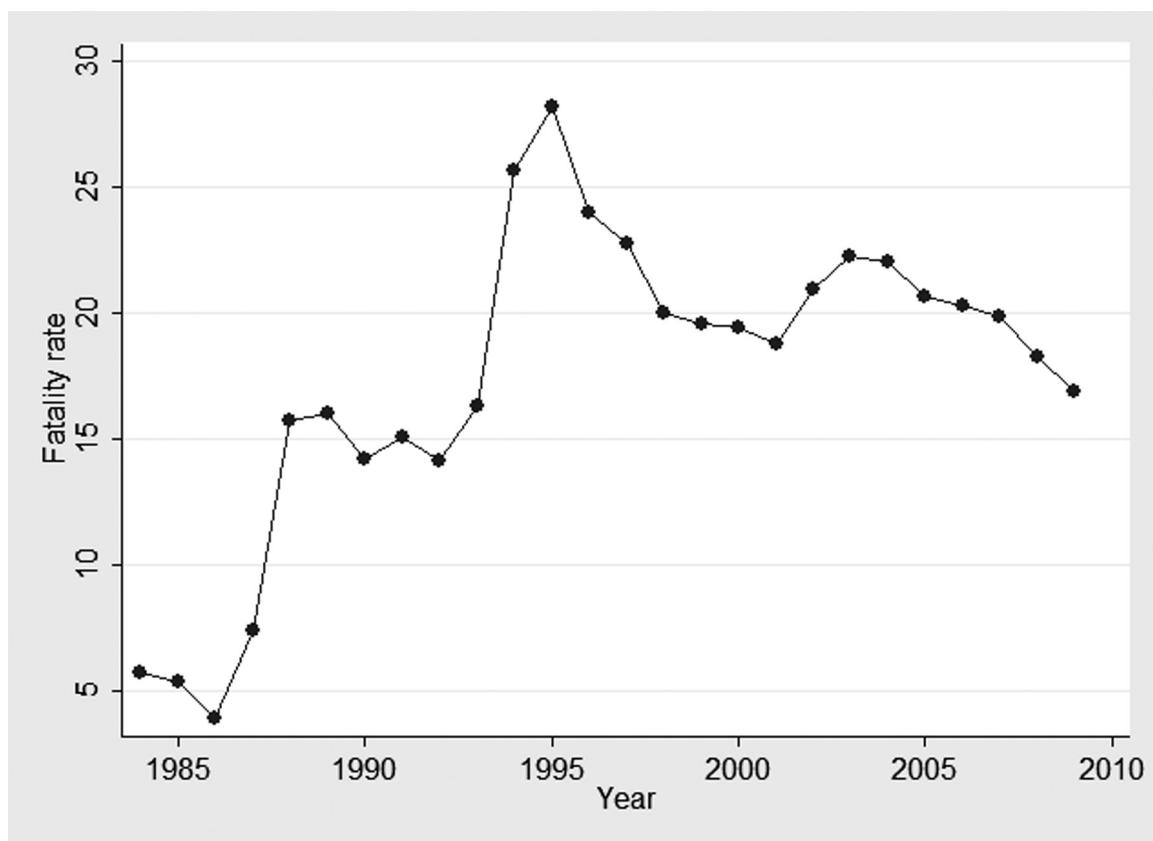
### 3.1 Road Crash Trends in Thailand

The time series data of road crash in Thailand has varied substantially in 1984 - 2009. The fatality rate has gone through three distinct peaks (1989, 1995, and 2003), with the fatality rate steadily decreased from 2003 onwards (Figure 1). The fluctuation in crash trend was associated with the economic cycle in Thailand (Tanaboriboon, 2005). During the economic recession period (1984 - 1986), the fatality rate was 5 per 100,000 while the average crash case was around 17 per 100,000 (or 19,000 cases per year). In the economic recovery period (1987 - 1992), not only the number of crashes dramatically rose about three times, but the severity was also more distressing as the fatality and injury rates leaped to about 15 deaths and 41 injuries per 100,000 populations, respectively. In the bubble economy period (1993 - 1996), road crashes shot up to about two to three fold from the previous period. The fatality rate also increased to about two times higher than that of the previous one, approximately 25 deaths per 100,000 populations. In the economic crisis period (1997 - 2000), there was a positive sign for the road crash situation. Road crashes were reduced to about 70,000 cases per year with the downward



trend on the fatality rate, but the injury rate showed a reverse trend with a high rate of 86 injuries for every 100,000 populations in 1998. As expected, when the

economy began the re-recovery era in 2001 to 2003 the number of road crashes rose again, as did the fatality rate.



**Figure 1** Fatality Rate in Thailand (1985 - 2009)

**Source:** Police Information Centre cited in Thailand Health Profile

### 3.2 National Policy and Allocation of Road Crash Prevention Budget in Thailand

The Thai government started to solve the road crash problem systematically in 2003 by the formation of an ad-hoc committee to tackle the problem of unusually high fatality rate during two annual long public holidays (namely International New Year and Thai New Year or Songkran festivals). According to the difficulty and continuity natures of this problem, the government eventually decided to maintain this committee and expanded its

membership. Recently the committee composed of high rank government officials representing various concerned agencies, private sectors and non-government organizations (NGOs). The Deputy Prime Minister chairs the Committee with Deputy Ministers of Transport, Public Health, Education and Interior as co-chairs. The Committee of the National Road Safety Center is responsible for policy formulation and directing and evaluating interventions and allocating budgets for road safety initiatives. Regarding the Global plan for the decade of action for

road safety 2011 - 2020, they suggested the effective interventions including "incorporating road safety features into land-use, urban planning, and transport; designing safer roads and requiring independent road safety audits for new construction projects; improving the safety features of vehicles; promoting public transport; effective speed management by police and through the use of traffic-calming measures; setting and enforcing internationally harmonized laws requiring the use of seat-belts, helmets and child restraint; setting and enforcing blood alcohol concentration limits for drivers; and improving post-crash care for victims of road crashes" (World Health Organization, 2011). These interventions could be categorized into the 5-E strategy: evaluation, education, engineering, enforcement and emergency medical service. Different countries focus on different aspects of road safety issues (World Health Organization, 2011). The Road Safety Direction Center of Thailand has also adopted 5-E strategy to prevent and reduce road traffic accident recently (The Road Safety Director Center, 2009). The 5-E strategy was therefore proposed in

Thailand as a framework for all concerned agencies to follow. More specifically, in the short term plan of 2010 - 2012 (or the National Road Safety Master Plan), the Thai government has focused on 8 measures namely promotion of 100% helmet for motorcyclists, reduction of drinking and driving, reduction of black spot, safe speed, safe vehicles, promotion of safe road user, improvement of EMS, and capacity development of management.

Road safety administration in Thailand is handled by a pool of government agencies depending on which aspects of road safety fall under their regular duties and responsibilities. We collected the road safety expenditure of various government agencies from the Bureau of Budget (BOB). The public expenditure was independently classified into 5 categories based on 5 key strategies (5E) by two researchers. The kappa statistics for the agreement between the two researchers was high (0.83). Table 2 shows the public investment for road safety of key agencies in road safety operation center. The details of activities of each agency will be explained as following:

**Table 2** Road Safety Spending in Thailand 2007 - 2011, by Agency (million baht)

Agencies	2007	2008	2009	2010	2011	Total
Ministry of Transport	7,534.6	9,340.2	9,072.6	12,323.2	15,088.8	53,359.4
Ministry of Education	2,756.5	3,974.9	806.2	1,261.2	4,291.9	13,090.8
Royal Thai Police	3,474.1	3,413.8	3,733.3	3,719.7	3,500.0	17,840.9
Ministry of Interior	546.3	180.0	150.8	90.0	99.75	1,066.8
Ministry of Public Health	14.0	8.0	112.0	54.0	164.8	352.8
Thai Health Promotion Foundation	181.9	154.9	149.8	175.8	194.7*	857.1
Road Safety Fund	528.1	574.5	551.2	413.1	596.1*	2,663.0
Total budget	15,035.5	17,646.3	14,575.9	18,037.0	23,936.1*	89,230.9

\* The data for 2011 were not available during the study; use data of 2006 to complete a five-year period Source: Authors' calculation based on the data from Bureau of Budget



### 3.2.1 Ministry of Transport

Under the Ministry of Transport, there are several agencies involved with road transportation and crash prevention, namely the Department of Highways (DOH), Department of Rural Roads (DORR), Department of Land Transport (DLT), and Office of Transport and Traffic Policy and Planning (OTP). Both DOH and DORR are the principal government agencies responsible for the design, construction, planning, and maintenance or repair of Thai highway networks. DOH supervises a special highway, a national highway, and a concession highway. DORR supervises only a rural highway. The fundamental tasks of DOH and DORR are to ensure that the comprehensive highway networks have a high level of convenience and safety for highway users. Emphasis has been placed on alleviating traffic crash problems on the highways while increasing road safety for users. About 7.7 billion baht per year (or about 80 percent of all road safety budgets for Ministry of Transport) has been allocated to DOH and DORR for preventing traffic crashes and improving hazardous locations along the highways through a number of highway safety improvement programs.

Department of Land Transport (DLT) has the responsibility of administering vehicle registrations and taxation as a main task. Apart from its regular duties, DLT also plays a significant role in preventing road crashes and promoting national road safety, particularly with respect to vehicle

inspections and regulations (promoting higher standard of vehicles), driver training, testing, and licensing. DLT has initiated several projects to address road safety problems that creates safety awareness among all road users and promotes the participation of local communities in preventing and reducing road crashes in their respective provinces. We classify the budget allocation for DLT as enforcement, education and engineering according to specified activities. On average, DLT has received about 500 million baht each year including overhead and salary cost for road safety activities.

The main duties of Office of Transport and Traffic Policy and Planning (OTP) are to formulate policies and plans for traffic and transport for the whole country and to coordinate the plans for all modes of the transport system so as to be consistent with the Traffic and Transport Master Plan, which should lead to the integration of national transport and traffic policies. Each year OTP has the budget relating to road safety activities about 450 million baht on education and evaluation. Apart from main agencies in Ministry of Transport discussed above, Office of the Permanent Secretary has annually received budget about 170 million baht for its tasks on developing an information system.

In summary, we found that 83, 8, 7, 2 percent of road safety allocation of Ministry of Transport are for engineering, evaluation, education and enforcement, respectively (Table 3).

**Table 3** Road Safety Spending in Thailand 2007 - 2011, by 5-E Strategy (million baht)

2007 - 2011	Enforcement	Engineering	Education	EMS	Evaluation	Total
Ministry of Transport	1,071.3	44,178.3	3,637.1	-	4,472.7	53,359.4
Ministry of Education*	-	-	1,309.1	10,472.7	1,309.1	13,090.9
Royal Thai Police	17,840.9	-	-	-	-	17,840.9
Ministry of Interior*	533.4	-	266.7	-	266.7	1,066.8
Ministry of Public Health	-	-	-	352.8	-	352.8
Thai Health Promotion Foundation	170.1	121.9	308.3	11.9	244.8	857.1
Road Safety Fund*	887.7	-	887.7	-	887.7	2,663.1
<b>Total budget</b>	<b>20,503.4</b>	<b>44,300.2</b>	<b>6,408.9</b>	<b>10,837.4</b>	<b>7,181.0</b>	<b>89,230.9</b>
<b>Percentage</b>	23%	50%	7%	12%	8%	100%

\* Classify by assumption

**Source:** Authors' calculation based on the data from Bureau of Budget

### 3.2.2 Road Safety Fund

DLT performs its duties in accordance with the Land Transport Act 1979, the Motor Vehicle Act 1979, the Non-Motorized Vehicle Act 1979, and other royal decrees and related ministerial orders. The modified Motor Vehicle Act 2003 empowered the director-general of DLT to raise money from the auction of the popular number of the auto plates to the Road Safety Fund (RSF) to promote and support road safety activities. The RSF has raised 3.7 billion baht from 212 auctions since 2003 and has allocated funding to several road safety research projects, driver training programs, provision of road safety equipment to the Royal Thai Police, such as speed cameras, breathalyzers, equipment for disabled persons, the mobile licensing units to remote areas, and the Drink Don't Drive checkpoint on festive periods. The RSF annually spends about 500 million baht for road safety activities.

### 3.2.3 Ministry of Education

The Ministry of Education has been involved in road safety work by promoting and creating awareness on road safety among schoolchildren and youth as well as their parents. There is no report on budget book, therefore, we cannot estimate the allocation amount. Apart from this issue, Ministry of Education has allocated budget to public universities for education, research, and evaluation on emergency medical service (EMS). To estimate the amount of allocation, we assume that 50 percent of the allocation on all medical services is for road safety related activities. Then, we classify to 5-E strategy by assuming that 80, 10, and 10 percentages are related to EMS, education, and evaluation, respectively. The government allocated the budget to the three universities across the country: Mahidol University (in Bangkok, central region), Naresuan University (Northern region), and Prince of Songkla University (Southern region). The cost estimates



include building cost, medical equipment, overhead and salary cost.

### **3.2.4 Ministry of Public Health**

The Ministry of Public Health (MOPH) is the principal agency responsible for promoting, supporting, controlling, and coordinating all health activities as well as providing health services for the population throughout the country. Emergency Medical Institute of Thailand (EMIT) was established in 2008 to take charge of the EMS system, including the establishment and development of EMS in provincial areas. Before the establishment of EMIT, the MOPH had allocated about 10 million baht each year for EMS through the Narenthorn Centre<sup>1</sup>. The EMIT has received the allocation about 100 million baht each year for providing and developing EMS systems countrywide.

### **3.2.5 Ministry of Interior**

The Department of Disaster Prevention and Mitigation (DDPM), Ministry of Interior, established in 2002 from the major government reform has a role in risk reduction activities of various disasters in Thailand. The DDPM's role in road safety focuses on coordination and support for road crash prevention activities initiated by related agencies and local authorities. Activities relating to road safety initiated by the DDPM are the operating of road safety centre in the festive periods including checkpoint for Drink Don't Drive campaign, promoting road safety awareness campaigns, setting EMS teams in the local area (one search and rescue team for each sub-district), and training of the rescue teams including EMS.

The DDPM annually allocates about 200 million baht to road safety.

### **3.2.6 Royal Thai Police**

The Royal Thai Police (RTP) is a national law enforcement organization with main duties on crime prevention and suppression, and the promotion of the Thai people's well-being. The RTP is responsible for road safety activities through traffic law enforcement. In the Bangkok metropolitan area, the Traffic Police Division and the nine metropolitan police divisions under the supervision of the Metropolitan Police Bureau are responsible for traffic surveillance activities aiming to reduce the number of victims involved in road traffic crashes. Several examples of traffic safety programs initiated by these police divisions are: the Drink Don't Drive; speed limit; car racing on public roads; helmet wearing for motorcyclists; and seat belt wearing for drivers programs (Asian Development Bank-Association of Southeast Asian National Regional Road Safety Program, 2012). As for areas outside Bangkok, the Highway Police Division is responsible for traffic law enforcement on approximately 15,000 km of national highways out of 60,000 km nationwide. The parts of highways not covered by the Highway Police are handled by provincial police. Beside the traffic law enforcement, The Office of Planning and Budget of the RTP operates the Police Information System Centre to collect and compile traffic crash data reported from all local police throughout the country. The RTP has allocated about 3.5 billion baht per year to all traffic police divisions.

<sup>1</sup> The Narenthorn Centre is a division under the Office of Permanent Secretary of the MOPH, which was established in April 2002 to take charge of health communication systems countrywide. At present, the Narenthorn Centre also plays a crucial role in monitoring and compiling statistics on road traffic injuries from relevant agencies nationwide during festive seasons, such as the New Year and Songkran holidays.

### 3.2.7 Thai Health Promotion Foundation

The Thai Health Promotion Foundation (THPF) is responsible for promoting, supporting, and funding health promotion activities for people in Thailand. Two percents of excise taxes from tobacco and alcoholic beverage have been earmarked to the THPF. To date, several road traffic safety programs have been financially supported by the THPF, such as the “Drink Don’t Drive”, 100% helmet wearing, road crash reduction and prevention campaigns, seminars on public participation in black spot identification, road safety pilot projects, road safety public awareness through mass media. The THPF has also financed several road safety research projects (including this research). Recognizing that the second cause of casualties of Thai people is road crash, however, road safety related funding from THPF is about 150 million baht annually or about 5 percent of the total THPF annual revenue.

### 3.2.8 Summary of Road safety Spending in Thailand by 5-E Strategy

Table 3 summarizes road safety expenditure by the 5-E strategy during the period 2007 - 2011. Thailand spent about 18,000 million baht each year (0.2% of GDP or 1% of total government expenditures) on road safety. The results show that engineering, enforcement, EMS, evaluation and education accounted for 50, 23, 12, 8, and 7 percent of the total road safety expenditures, respectively. In terms of engineering strategy, most of the budget has been used by the Ministry of Transport as we can expect. The Royal Thai Police is an organization directly responsible for law enforcement and it spent around 18,000 million baht in 2007 to 2011. This cannot identify that this amount of budget is too high or too low to change people’s behaviors but one of the obvious evidence shows that less than 50% of Thai population wearing helmets

when driving (Thai Roads, 2012). Evaluation is also the main concern worldwide; however, in the case of Thailand, there is not direct institution accountable to management for database system. Regarding our results, the Ministry of Transport devoted more budgets to the evaluation strategy than the other state agencies.

## 4. Discussion

Based on our results, the policy implementation on road safety investment in Thailand is specified into 6 points corresponding to 5-E strategies and the most critical suggestions from interviews with the RTI experts and the steering committee progress meetings.

### 4.1 Enforcement

The government has launched the Seven Day High Risk campaign to reduce road crashes over the two long New Year holidays (New Year and Songkran festivals), by emphasizing on traffic law enforcement and public relations. The recent data shows the downward trend of road crash casualties and about 27 percent reduction of deaths, as can be seen in table 4. This fact implies that enforcement is effective in reducing the number of casualties. The key successes of this campaign are the collaboration of various agencies such as traffic police division, EMIT, DLT and local authorities, and extra spending for preventing crash in that periods. Moreover, the Thai government has set the target of the number of casualties and will hold the provincial governor responsible if they could not achieve the target. These lessons show that if we put more efforts on enforcement it is possible to control the epidemic of traffic fatalities and injuries. Although the campaigns during long holidays are relatively successful, enforcement is still the main issue for the road crash reduction. For example, helmets first become compulsory cross the country



since 1999, but a recent national survey in 2011 has shown that only 55% of Thai motorcycle drivers and 25% of the passengers wore helmets (Thai roads, 2012). The major barriers to enforcement are lack of resources (equipment, manpower and specific budgetary supports), lack of trainings and unclear strategy for the traffic police work. There is a need for more police equipment, for example

breathalyzers and speed laser guns, to cover more areas and intensity. The maintenance costs of equipment are also the major concern. According to our interviews with the police officers, they complained about the lacking of maintenance costs which lead to defective equipment. These barriers could be a result of weak policy and insufficient capacity management.

**Table 4** Road Crash Casualties during the New Year Holidays

Year	International New Year			Thai New Year		
	Crashes	Injuries	Fatalities	Crashes	Injuries	Fatalities
2006	4,419	4,772	441	5,327	7,287	485
2007	4,456	4,943	449	4,274	4,805	361
2008	4,475	4,903	401	4,243	4,803	368
2009	3,824	4,107	367	3,977	4,332	373
2010	3,534	3,827	347	3,516	3,802	361
2011	3,227	3,453	325	3,215	3,476	271

#### 4.2 Engineering

Provision of safe roads is the objective of DOH and DORR. However, it appears to have given very low priority or allocation to road safety in the past. They primarily focus on rehabilitation and construction of the road network. These result in many dangerous spots for road users. For safety engineering improvement, it is necessary to do both the crash reduction (identification and treatment of black spot locations) and the crash prevention (road safety audit to identify a potential unsafe situation thus a potential hazard can be avoided). For new road network projects, the desired road safety standards are recommended.

#### 4.3 Education

Traffic safety education program has been launched by MOE since 1993 to provide training and educational materials for schoolchildren at the primary and secondary level. The Work Bank

funded the development phase. However, the budget request for implementation phase has not been granted (Suriyawongpaisal and Kanchanasut, 2003). According to our analysis, safety intervention related to education strategy has been about 7% in 2007 - 2011. Most of the budget is for research in traffic safety and EMS areas. Even though efforts are made in some parts of the country to teach children safe traffic conducted by police, there appears to be no implementation as the national strategy. Government should put more effort on the traffic education of schoolchildren. Long termed national strategy and target setting in traffic safety education should be drawn up. Therefore, it can be monitored and evaluated the progress of the results.

#### 4.4 Evaluation

Comprehensive crash data is required for effective interventions in road safety. At national level the overall trends, regional distribution of

crashes and fatalities and behavior risks can be used to develop national level road safety interventions e.g. public campaigns and revision of safety legislation. At local level crash data can be used to identify black spot locations and specific interventions suitable for different areas. The crash data system needs significant improvement to permit more effective storage, analyses and dissemination of data. Information in the database should be used as an analytic tool for an in-depth crash analysis or research. Another major deficiency is the lack of dissemination of data to the road administrations and coordination with the health authorities on definition and registration of fatalities. In Thailand there is no consensus on the definition of traffic fatalities. Hospitals only report the case where the victims encountered were dead upon arrival at an emergency room or during hospitalization. Police only report the victims who were dead at the scene. Therefore, efforts should be made on introducing a new crash data form nationally and installing a new national crash data system integrated police and hospital data together with significantly enhanced analysis capability. This will enable more effective analysis of the underlying characteristics and nature of the problem and identification of high risk groups for attention.

#### 4.5 Lead Agency

Since Thailand has no direct institution taking responsible for road safety projects, while all of the road safety projects need interdisciplinary collaboration. Working across organizational boundaries is not practically easy and from the interview this was believed to be one of the most important factors leading to inefficiency in road safety programs. The National Road Safety Centre (NRSC) of Thailand seems to have the proper mix of government agencies and non-government organizations (NGOs) in the committee boards for

effective work. It is also developing a provincial structure which intends to strengthen the road safety work in local areas. According to the steering committee meeting, one of the main conclusions is that for sustainable road crash reduction management, to decentralize actions but centralize monitoring is the main concern, which means either provinces or districts should have authority and sufficient budget to manage RTI programs in their own ways but be regulated and supervised by the national centre. However, NRSC has no independent budget allocations and no permanent support to enable effective follow up on its initiatives and decisions. Moreover, the secretary (DDPM) also has a responsibility to various risk reduction activities beside the road crash. The fundamental problems are that NRSC is only a consulting commission with no powers to implement or to direct other agencies to implement. It does not have its own budget to initiate cross sector activities or to implement safety initiatives. It also does not have adequate number of permanent technical and administrative staffs with specific powers and responsibility to follow up and ensure all stakeholders develop individual action plans to implement their parts of the national road safety strategy. Without such powers, financial and technical resources the NRSC cannot ensure effective implementation of national road safety strategies.

To achieve road safety performance targets, NRSC may need to establish new funding sources and mechanisms. Each agency with road safety responsibilities should have budgets for the extending and improving the basic functions and activities especially the recommended in the national road safety plan. Moreover, NRSC need its own funds that can be used to finance cross sector activities or cross stakeholder initiatives that cannot be financed from one stakeholder. NRSC should have a flexible



funding structure that can be used to initiate useful interventions or developments that will benefit safety. Such funds can also be used for stakeholders to apply for on a competitive basis if they have special projects or initiatives that they cannot finance from within their own budgets. NRSC should have ability to implement pilot or demonstration projects to encourage particular activities that might be beneficial to road safety.

## 5. Conclusion and suggestion

In summary, the burden of injury in Thailand remains high. This is the first study indicating the amount of public spending on road traffic accident plans and programs. The evidence confirms a low investment in road safety interventions comparing with developed countries (see table 3 in appendix). For example United Kingdom government spends roughly 1 billion British pounds in year 2000 on road safety (Aeron-Thomas, 2002). That might be because they have more money to spend than Thailand. According to table 3 (in appendix), Thailand has higher proportion of road safety spending per capita to income per capita than most countries apart from New Zealand and Poland. However, what proper amount of budget to invest is difficult to decide since there is insufficient information and evidence to evaluate the efficacy of the RTI policy and programs. Although we found the relationship between budget invested in road accident and a reduction of crash rate, fatality rate and injury rate (Figure 1 and Table 2), we cannot reasonably decide that that is because of more investment in road accident from 2007 to 2011. However, from our results and discussion points showing inefficient solution for road traffic accident, we would suggest the Thai government to more seriously focus on the strategies relevant to “enforcement”, “education” and in particular “evaluation”. Though engineering and

medical emergency are helpful in terms of reducing serious injuries and fatal cases, the effective enforcement and education programs will help changing people behaviors resulting in sustainable prevention of road accident eventually. Reliable and dynamic road safety database is needed to ensure effectiveness of the programs implemented. Thailand has no systematic cost-effectiveness or cost-benefit studies of road safety interventions. This kind of information will help policy makers making decision on what interventions should be implemented and also how to implement successfully. The reasons for lacking such an analysis are not only because of inadequate information, but also the relative under-investment in research. NRSC can act as the lead agency to develop R&D (research and development) on road safety as well as manage data system. To encourage more traffic safety investment, government needs the convincing information on effectiveness of each intervention. Rational budget allocation is a big challenge for road safety. Establishment of rational budget allocation practice demands a relevance evidence, transparency and fairness of budgeting process, and a framework that is both technically and politically accepted. Policy researchers and analysts could play a crucial role in the provision of the evidence and framework. This could enhance transparency and acceptability of budget allocation decision.

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**Conflict of interest**

None declared.

**References**

Aeron-Thomas, A., Downing, A.J., Jacobs, G.D., Fletcher, J.P., Selby, T., Silcock, D.T. (2002). *Review of road safety management practice: final report*. Retrieved February 5, 2011, from <http://www.dfid.gov.uk/r4d/Output/5004/Default.aspx>

Asian Development Bank-Association of Southeast Asian Nations Regional Road Safety Program; Country Report CR 9: Thailand. Retrieved March 12, 2011, from <http://www2.adb.org/documents/reports/Arrive-Alive/Country-Reports/ctry-report-09-tha.pdf>

Bureau of Non Communication Disease, Ministry of Public Health. (2012). *Thailand Status of Road Safety, Thailand*. Retrieved February 22, 2011, from <http://www.thaincd.com/media/leaflet/injured.php>

Decade of Action and Arrive Alive National Road Safety Strategy 2011-2020, from <http://www.arrivealive.co.za/documents/Road%20Safety%20Strategy%20for%20South%20Africa%202011.pdf>. Retrieved February 25, 2014

European status report on road safety: towards safer roads and healthier transport choices. (2011). Copenhagen, WHO Regional Office for Europe, 2009. It can be found at [http://www.euro.who.int/-data/assets/pdf\\_file/0015/43314/E92789.pdf](http://www.euro.who.int/-data/assets/pdf_file/0015/43314/E92789.pdf). Retrieved April 20, 2011.

Jacobs, G.D., Aeron-Thomas, A. (2002). *A Review of Global Road Accident*. Retrieved February 13, 2011, from [www.transport-links.org/transport.../1\\_771\\_pa3568.pdf](http://www.transport-links.org/transport.../1_771_pa3568.pdf)

Suriyawongpaisal, P., Kanchanasut, S. (2003) 'Road traffic injuries in Thailand: Trends, selected underlying determinants and status of intervention'. *International Journal of Injury Control and Safety Promotion*, 10 (1-2), pp. 95-104

Tanaboriboon Y., Satiennam, T. (2005) 'Traffic Accidents in Thailand', *IATSS Research*, 29 (1).

Taneerananon, P. (2008). The Cost of Road Accidents in Thailand, Technology and Innovation for Sustainable Development Conference (TISD). Faculty of Engineering, KhonKaen University, Thailand, 28-29 January 2008.

Thai Roads. (2011). *Motorcycle Helmet Use in Thailand 2010-2011, Thailand*. Retrieved March 8, 2012, from <http://trso.thairoads.org/resources/4809>

Thai Road Foundation and the Road Safety Director Center. (2014). *Results of helmets used survey*, from <http://www.roadsafetythailand.com/main/files/data1/2012-01-01-helmet-wearing-rate-2554.pdf> Retrieved 25 February 2014.

The Road Safety Director Center. (2009). from [http://www.roadsafetythailand.com/main/files/data1/action\\_plan54-55.pdf](http://www.roadsafetythailand.com/main/files/data1/action_plan54-55.pdf) Retrieved 25 February 2014

World Health Organization. (2011). *Global plan for decade of action for road safety 2011-2020*, Retrieved January 15, 2011, from [http://www.who.int/roadsafety/decade\\_of\\_action/New](http://www.who.int/roadsafety/decade_of_action/New)

World Health Organization. (2011). *National plans for the Decade of Action for Road Safety 2011-2020*, from [http://www.who.int/roadsafety/decade\\_of\\_action/plan/national/en/](http://www.who.int/roadsafety/decade_of_action/plan/national/en/) Retrieved 25 February 2014



## Appendix

**Table 1** Kappa Analysis

	Expert 2							
	Item	Unidentified	Enforcement	Engineering	Education	EMS	Evaluation	Total
Expert 1	unidentified	6	0	0	0	0	0	6
	Enforcement	0	5	8	0	0	0	13
	Engineering	0	0	12	0	0	0	12
	Education	0	0	0	10	0	0	10
	EMS	0	0	0	0	3	0	3
	Evaluation	0	0	0	0	0	15	15
	Total	6	5	20	10	3	15	59

Kappa	Interpretation
< 0	Poor agreement
0.0 - 0.20	Slight agreement
0.21 - 0.40	Fair agreement
0.41 - 0.60	Moderate agreement
0.61 - 0.80	Substantial agreement
0.81 - 1.00	Almost perfect agreement

	Value	Std. error
Measure of Agreement (Kappa)	0.832	0.054
No. of valid cases	59	

**Table 2** Crash Statistics in Thailand 1984 - 2009

Year	Number of			Casualty rate per 100000 population		
	Crashes	Injuries	Fatalities	Crash rate	Fatality rate	Injury rate
1984	18,334	8,770	2,904	36.245	5.74	17.34
1985	18,955	8,901	2,788	36.595	5.38	17.18
1986	24,432	9,242	2,086	46.369	3.94	17.45
1987	25,639	12,947	3,991	47.591	7.41	24.03
1988	43,439	22,370	8,651	79.036	15.74	40.7
1989	43,557	23,083	8,967	77.935	16.04	41.3
1990	43,646	23,161	7,997	77.519	14.2	41.14
1991	49,625	24,995	8,608	87.12	15.11	43.88
1992	61,329	20,702	8,184	106.125	14.16	35.82
1993	84,892	25,330	9,496	145.522	16.28	43.42
1994	102,610	43,541	15,176	173.634	25.68	73.68
1995	94,362	50,718	16,727	159.185	28.22	85.56
1996	88,556	50,044	14,405	147.308	23.96	83.24
1997	82,386	48,711	13,836	135.467	22.75	80.09
1998	73,725	52,538	12,234	120.552	20	85.91
1999	67,800	47,770	12,040	110.14	19.55	77.58
2000	73,737	53,111	11,988	119.372	19.41	85.98
2001	77,616	53,960	11,652	124.997	18.76	86.9
2002	91,623	69,313	13,116	146.469	20.97	110.8
2003	107,565	79,692	14,012	170.901	22.26	126.62
2004	124,530	94,164	13,766	199.162	22.01	150.6
2005	122,040	94,364	12,858	196.218	20.67	151.72
2006	110,686	83,290	12,693	176.748	20.27	133
2007	88,689	79,029	12,492	161.681	19.85	125.57
2008	84,806	71,059	11,561	155.331	18.29	112.41
2009	84,806	61,996	10,717	133.642	16.89	97.69

**Table 3** Road Safety Spending

Country	Population (million)	Income per capita (euro)	Road safety Spending (million euro)	Year	Road safety spending per capita (Euro)	Road safety spending per capita/income per capita (%)
Croatia	4.56	10,460	2.08	2008	0.5	0.005
Cyprus	0.86	24,940	7	2008	8.1	0.032
Estonia	1.34	13,200	15.4	2008	11.5	0.087
France	61.65	38,500	2,300	2007	37.3	0.097
Hungary	10.03	11,570	13.03	2008	1.3	0.011
Iceland	0.30	54,100	3.49	2007	11.6	0.021
Israel	6.93	21,900	101.78	2008	14.7	0.067
Italy	58.88	33,540	53	2008	0.9	0.002
Lithuania	3.39	9,920	5.69	2007	1.7	0.017
New Zealand	4.18	28,780	583.28	2008	139.6	0.485
Poland	38.08	9,840	623.33	2007	16.4	0.167
Russia	142.50	7,560	245.73	2007	1.7	0.022
Slovakia	5.39	11,730	0.96	2008	0.2	0.002
Slovenia	2.00	20,960	2.2	2008	1.1	0.005
Spain	44.28	29,450	881.03	2008	19.9	0.068
Thailand	63.88	3,400	367.05	2008	5.7	0.168

**Source:** WHO (2009)

**Table 4** Mode of Transport Involved in Road Traffic Injury in Thailand

	2006	2007	2008	2009
Pedestrian	5,026	3,977	3,539	3,306
Bicycle	2,863	2,218	2,117	2,312
Tricycle	570	343	484	266
Motor cycle	75,752	68,140	59,189	52,608
Motor tricycle	1,442	1,210	992	987
Passenger car	42,091	40,687	40,334	39,275
Van	3,140	2,634	2,433	2,218
Pick up	27,871	28,822	24,483	23,650
Heavy bus	3,391	2,961	2,534	2,370
Medium truck	3,022	2,679	2,435	2,139
Heavy truck and semi trailer	4,715	4,133	3,528	2,815
Other	8,870	9,625	9,042	8,548

<http://healthsci.stou.ac.th/page/Showdata.aspx?PageId=21124&Datatype=1>