Analysis of Roadside Safety of Highways in South Thailand

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Abstract

Every year, the number of road crashes in Thailand, which result in about 12,000 deaths has been around 1 million. During the period between 2007 and 2010 the number of recorded vehicular accidents on Thailand's highways was 53,718, or 13,430 cases per year. About 5900 cases or 44% of the cases involved vehicles crashing into roadside objects. This paper describes the roadside crash situation on Thai highways by using DOH records of 949 crashes that occurred during 2007-2010 on 270 km, section in Southern Thailand. The results show that speeding vehicles are more likely to be involved in roadside crashes accounting for about 70% of the crashes. Among all passenger vehicles (passenger cars, vans, pickups, and Songtaew (converted passenger pickup), pickups are more likely to be involved in roadside crashes as compared to other passenger vehicle types. Detailed investigation of in depth roadside crashes is also described. The DOH has started actions the roadside tree problem, a description of the action is described the DOH Roadside Safety Strategic Plan 2009-2013.

Keywords: Roadside crashes, Roadside hazards, Roadside safety strategies

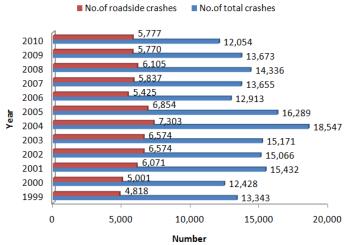
1. Introduction

Road safety is a global concern as many countries are now combating the rising trend in road accident casualties (Seyed et al., 2011). Road deaths rank as the world's 8th in terms of volume as a proportion of all deaths. If the present trend continues unchecked, by 2030 road deaths will become the world's fifth leading cause of death. Globally, road crashes are the cause of some 1.3 million fatalities each year with 90 percent of the victims being in low and middle-income countries, while crash-related injuries are suffered by some 20 to 50 million people. They are also the leading cause of death for people from 10 to 24 years of age (Global Road Safety Partnership Annual Report, 2010). According to the UN, efforts should be directed towards modifying behaviors or correcting issues that are the root causes of road traffic fatalities and injuries; these include excessive speed, incorrect use of seat-belt and child restraint, drink driving, lack of helmet use by riders of motorcycles or other exposed vehicles, inadequacies in road design, maintenance, vehicle functions, and trauma care (UN Resolutions, 2011). WHO and the UN regional commissions, in cooperation with partners and stakeholders in the United Nations Road Safety Collaboration program have developed a Global Plan for the Decade of Action for Road Safety 2011-2020. In the plan, five major "pillars" of activities are to be promoted: road safety management; safer roads and mobility; safer v ehicles; safer road users; and post-crash response (www.who.int, 2012). Thailand is facing a challenging situation due to her very high road fatality rates. The country's crash fatality rate for year 2009 stood at 17.0 deaths per one hundred thousand of population (the year's toll being 10,717 deaths). Despite the best of efforts by Thai authorities to reduce traffic accidents, the number of crashes still exceeds 13,000 re sulting in about one million injuries and several hundred thousand cases of disabilities every year (Taneerananon, 2006).. Trees, rock cuttings, rigid poles and unprotected bridge support are deemed to be more hazardous than guardrails as the latter tends to cause less injuries when struck (Elvik, 2001). Trees and utility poles are reported as t he most frequently struck roa dside objects. Studies in Europe have shown between 18% and 31% of all fatal accidents is cause d by collisions with roadside objects. The percentage of such deaths rose to 42% in the case of Germany (ETSC, 1998). For the US, the Department of Transportation's Fatality Analysis Rep orting System (FARS) found that the data of fixed object crash deaths in 2010 showed high percentage of deaths from hitting trees (50%); with utility poles and traffic barriers the next most frequent objects struck (IIHS, 2010). A study of over 3000 bus crashes on Thai highways for the period 1997-2000, which resulted in about 1,500 deaths, confirmed that roadside hazards were one of the key elements contributing to the (Taneerananon and Somchainuek, 2005).

Fig. 1 sh ows the trends of total crashes and roadside crashes on the national highways from 1999 to 2010. However, the trend of road crashes fluctuated during the past eleven years. The trend initially increased from 1999 to 2004. After that it decreased to the minimum (5,425 cases) in 2006. Although the trend is steady from 2007 to 2010 (around 5,837 to 5,777 cases). For the past four years, 2007-2010, roadside crashes have constituted between 42.2 - 47.9 % of the total

crashes on the DOH's highways. On average there is about 12000 crashes on Thai national highways and roadside crash accounts 5900 cases or 44%., the DOH should prepare a strategic action plan to improve the roadside safety along the national highways (Bureau of Highway Safety, 2011)

Fig.1. Trends of number of total and roadside crashes on national highways from 1999 - 2010



2. Data and Methodology

The data used in this study are c ollected from DOH during the period 2007 to 2010 on 270 km. Section in Southern Thailand. All analyses in this report pertain to roadside crashes that involve passenger vehicles, including cars, vans, pickup trucks, and utility vehicles. With respect to the number of accidents by national highway number, Table 2 shows the vast majority of accidents along the national highways of highway No.4, highway No. 41, and highway No. 414, with a total of 407, 379 and 174 accident cases over the past 4 years respectively. Given that the availability of complete annual accident data, highway sections in Nakhon Si Thammarat province, Pattalung province and Songkhla province are selected as study areas, including National Highways No. 4, No. 41 and No. 414.

This study considered the roadside accidents location by straight sections, curve sections, intersections, and U-Turns. The highest proportion of roadside accidents was found in straight sections. This could be due to the physical characteristics of the straight roads which cause people to drive at high speeds. Roadside Furniture comparing the proportion of roadside accidents by type of roadside furniture indicates that the proportion of roadside accidents by hitting trees (30 %) is higher than for other types of roadside furniture. This finding may be due to the fact that there are more trees and they prevent trees from growing in hazardous locations.

Table 1. Detailed analysis of roadside crashes and casualties on from 2007 - 2010 records

Item	Number	Percent	Item	Number	Percent
Type of involve d vehicle			Causes		
Passenger car	247	26	Speeding	645	68
Pick up	446	47	Sleepy	171	18
6-wheel	57	6	Defective vehicle	57	6
10>wheel	114	12	Improper passing	38	4
Bus	38	4	Drunkenness	10	1
Motorcycle	24	3	Other	28	3
Other	24	3			
Roadside furniture			Roadside location		
Guardrail	66	7	Straight	607	64
Guide post & KM post	104	11	Curve	142	15
Traffic sign	133	14	Intersection	66	7
Tree	285	30	U-Turn	104	11
Electric pole	266	28	Others	28	3
Traffic signal	19	2			
Others	95	10			

3. Accident Investigation: Case Studies

The tree-sitting problem has been recognized as one of the most grievous lessons in Thailand. Roadside trees have been caused many roadside crashes on national highways. The char acteristics of the roadside crashes caused by roadside trees tend to be in similar manner. This practical paper, therefore, illustrates only experienced cases in the South of Thailand in order to discover the cause of roadside crashes, highlighting the trees sitting issue, and give awareness in improving roadside safer. The details are described separately as follows.

Fig.2. Location of case roadside with trees on Thai national highways for study



4. Case study: Songkhla Province

The crash involved vehicle, Honda Civic, was reported running into the median on the right side of the road at the position of Lat: 7.091353N, Long: 100.504603E on Highway No. 414. At 03.20 p.m. on 22 February 2012, a passenger car was bound from Hat Yai district and going to Muang district, Songkhla province. The driver was speeding; lost the control, ran off the road and the vehicle then hit a tree with a diameter of 0.30 m. This off road crash caused 6 deaths. Location of the crash and the schematic sketch of the crash location are shown in Fig. 3.

Fig.3. Schematic sketch of case



5. Casualty Information

The driver and passenger were found dead with severe head injury. Is shown in a num ber of casualties classifie d by severity from case is summarized in Table 2.

Table 2. Number of casualties classified by severity from case ctudy

Person	Role	Gender	Age	Seating Position	Seat belt	Severity
1	Driver	Male	26	Front- right	Not used	Fatal
2	Passenger	Male	24	Front-left	Not used	Fatal
3	Passenger	Male	22	Back	Not used	Fatal
4	Passenger	Female	21	Back	Not used	Fatal
5	Passenger	Female	27	Back	Not used	Fatal
6	Passenger	Male	27	Back	Not used	Fatal

6. Vehicle Information

Fig. 4 shows the photo of the passenger car. The car was seriously mangled after hitting the roadside trees. The passenger car was a Honda Civic Dimension, 1500 cc. patrol engine with a speed automatic transmission and front wheel drive. It was white in color. The original dimensions were 1.72 m. wide, 4.45 m. long, and 1.44 m. high. The original wheels were modified.

Fig.4. The picture of the damaged passenger car





7. Road and Environment Information

Fig. 5 shows the road environment and roadside tree at the crash location. This evidence ensures that the driver was speeding. In the area of the crash, it was a 4-lane divided road, 3.5 m lane wide asphaltic concrete pavement and 2.0 m wide asphaltic concrete shoulder. In addition, the roadside tree with a diameter of 0.30 m, located 3.0 m away from the edge of the right shoulder. From the investigation, the point of impact is located after the transition where not any guardrail along the inner lane.

Fig.5. The photo of the Crash Scene showing of Run-off Road

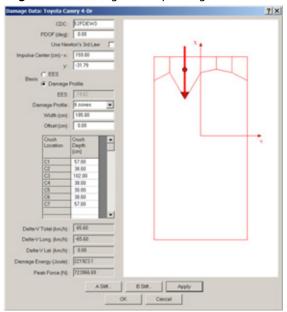


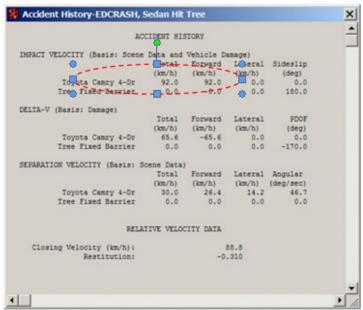


8. Crash Analysis

After applying the concept of reconstruction, the speed required from the run-off the road to the POR were calculated. The initial speed was estimated by applying the principle of physics based on the measurement of vehicle deformation. The traveling speed was found at 92.0 kph, which was under the speed limit (100 kph) along this section of the national highways.

Fig.6. Picture of diagram the passenger car





9. Lessons from Case

The lessons obtained from this case are summarized as follows:

- The aggressive driver may be considered as the major factor, which leads to many tolls in this crash.
- The driver and 5 passengers are not wearing seat belts. The doctor's decision found that all six people have died, four people are drinking alcohol and one in four people drunk alcohol above the legal drink drive limit (assumed to be driver). The hospital did not disclose the amount of alcohol because the preliminary autopsy found that four people have died in drug addiction.
- If the roadside forgives the driver by proving clear depressed median without any tree, the grief may not be happen. Unfortunately, the crash may be less severe.

The initial contributing factors of two experienced cases were from different factors. Similarly, cases address the problem caused by the roadside trees. The tree-sitting factor almost was at the end of the chain of events. However, the roadside tree issue intensively created the severe impact of the crashes. This grievous lesson often occurs on the national highways across Thailand.

10. Thailand Roadside Safety Strategic Plan

Thailand has adopted the roadside safety standard that is different from European countries such as Germany and Hungary. Recently, the DOH has implemented the Roadside Safety Strategic Plan 2009-2013 in order to improve roadside safety along national highways. The plan consists of five major strategies including (Ruangsooksriwong et al., 2010).

Increase the awareness for roadside safety;

Increase knowledge on the cause, location, mechanism, costs and effective treatments of roadside crashes;

Strategy 3: Prevent vehicles from running off the highway;

Strategy 4: Protect errant vehicles from hitting roadside objects or rolling over;

Strategy 5: Reduce the severity of crash impact for the occupants of errant vehicles.

Two main emphasis areas were covered prevent trees from growing in hazardous locations and eliminate the hazardous condition and reduce the severity of the crash. Several strategies were proposed to address these objectives.

Fig.7. Improvement Roadside safety, tree removal in hazardous locations





11. Conclusions and Recommendations

This paper has addressed the roadside issue of crashes, the information shows that roadside crashes resulting from vehicles hitting roadside trees feature prominently on national highways especially in up country provinces. Each year, 13,000 crashes occur on 60,000 km of national highways

under the jurisdiction of the Department of Highways (DOH), resulting in 1,300 deaths, 44% are roadside crashes which kill 500 road users annually. This paper describe the roadside situation on Thai highways on by using DOH records of 949 crashes that occurs during 2007-2010 on 270 km section in Southern Thailand. The problem of trees locating in the clear zone must be seriously addressed by concerned authorities. From roadside crash data compilation, it was found that those roadside trees were involved in about 30% of the roadside crashes. The majority of these deaths occur as a result of erring drivers running into trees which are advertently planted for aesthetic. Finally, the roadside safety design was explained. A number roadside safety standard was shown. Roadside crashes and their serious consequences can be avoided or reduced by taking in account the roadside hazards, clear zone, and roadside and median barriers. The problem of trees locating in the clear zone must be seriously addressed by concerned authorities. Roadside crashes and their serious consequences can be avoided or reduced by implementing the DOH's Roadside safety strategic plan. This plan with the five key strategies aims to both prevent the crashes from happening and to protect the vehicles' occupants should a crash occur.

12. References

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