



The Land Transport Safety Division
Department of Land Transport

Executive Summary

Study and Analysis of Accidents Involving Large Trucks in Thailand

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Introduction

Road accidents are undeniably one of the most pressing problems in Thailand. Integrated data from the Ministry of Public Health, the Royal Thai Police, and the Road Accident Victims Protection Company Limited reported 21,000 deaths from road accidents nationwide in 2016. The macroeconomic loss resulted from the unfortunate events are insurmountable, with the majority of victims being those in their adolescent- and adulthood. A 2016 report entailing road accident statistics from ThaiRoads Foundation cited motorcycles, private cars, and pickup trucks as vehicles most frequently involved in traffic accidents. Statistically, even though large trucks account to only three percent of all records, the accidents with their involvement usually lead to a large number of deaths and severe injuries. The colossal size and mass of large trucks naturally exacerbate the severity of the situations. Additionally, the accumulated number of large trucks registered with the Department of Land Transport or DLT is 1,120,209 in total and segregates into 314,681 non-fixed route trucks and 805,528 private trucks. Crashes involving large trucks based on the DLT's 2015-2017 report recorded 1,781 incidents, 1,228 deaths, and 3,906 injuries.

In 2018, the Land Transport Safety Division, Department of Land Transport improved its road accident reporting system for communal buses and trucks; a variety of information products concerning road accidents were collected as a result. The team also published a report analyzing circumstances surrounding the accidents and summarized overall insights—categorized by the counts of accidents, deaths, and injuries per month and per annum. The report also classified the accidents by vehicle types, third-party vehicles, time of the day with high accident occurrence frequency, provinces where accidents took place, and probable causes of accidents. Although the report only detailed out accidents involving communal buses and trucks, the data available concurrently facilitated thorough analyses of road accidents in other dimensions. Other entities whose areas of work revolve around traffic incidents also put

together datasets exploring accidents with truck involvement (e.g., the Department of Highways and the Department of Rural Roads). The incoherence and decentralization of different databases have stalled the holistic understanding of truck accidents and prohibited the on-point identification of the root causes.

In order to label the causes and risks contributing to truck accidents, truck drivers' road safety behaviors, physical conditions of trucks, and usage of trucks on highways needed to be thoroughly examined in addition to accident datasets. These are the three potential factors influencing truck crashes. The wholesome analysis of primary and secondary data—accident patterns, drivers' behaviors, truck conditions, and truck usage—will shed light on what the genuine causes of accidents are as well as problematic areas that require resolutions. Regulatory- and policy-related truck safety measures were also studied and reviewed, together with accident-related data from official sources (i.e., the Department of Land Transport and the Department of Highways). The team also conducted on-site interviews to collect primary information addressing truck drivers' road safety behaviors, physical conditions of trucks, and usage of trucks with safety impacts. The ultimate deliverables of the study are guidelines on regulation and policy improvement to augment transportation safety for the large vehicles. Additionally, seminars and workshops will be organized for educational purposes and opinion gathering of related stakeholders.

With its mission to educate drivers, improve, and strategize transportation safety policies for safer commute, the Land Transport Safety Division at DLT acknowledged the importance of uplifting the safety measures for trucks. Well-rounded data analysis was identified as the most effective methodology to find the root causes of truck accidents. The insights obtained from this study will play a crucial role in supporting new policy push and will be released to the general public for road safety awareness. The findings will also be used in future road safety projects focusing on truck maneuvering. External consultants were brought in to advise the best approaches for truck accident data analysis and to keep the DLT team updated with most recent information available.

Objectives

1. To advise and recommend the most appropriate analytical frameworks to analyze truck accident data in order to understand the current truck accident situation.
2. To survey truck drivers' safe driving behaviors, physical conditions of trucks, and usage of trucks that impacts road safety. The results will be used to better understand the causes surrounding truck accident occurrence.
3. To provide guidelines for the improvement of trucks safety measures, using data analysis results and other supplementary information obtained throughout the project as the main materials

Methodology

1. Study and review current transportation safety regulations to set boundaries to the problem statements and future recommendations on road safety measures for trucks
 - Review transportation safety regulations and policies used currently and historically in Thailand
 - Review transportation safety regulations and policies that have never been used in Thailand
2. Survey truck drivers' road safety behaviors, physical conditions of trucks, and usage of trucks that impacts road safety
3. Analyze secondary data about road accidents involving trucks and survey data from primary research
4. Propose guidelines on how to better regulate road safety for trucks, taking into account all dimensions of the data obtained throughout this study
5. Organize a workshop seminar to educate stakeholders and survey for opinions

Summary of the Results

1. Study and review current transportation safety regulations for trucks

Review road safety regulations and policies used currently and historically in Thailand, for example, the laws on transportation safety / training sessions on transportation safety for logistics truck drivers / quality assurance for commercial trucks / GPS tracking for commercial trucks / the provision of route tracking notebooks, drivers' profiles, vehicle conditions and readiness check for trucks and drivers, and logistics accident records / the installation of

equipment and reflectors onto the vehicle body / the provision of necessary signs and symbols in case of roadside pull-over / the installation of container twist-locks and instrument for safe transportation of hazardous materials.

Review transportation safety regulations and policies that have never been used in Thailand, for example, solutions to the blind spots for trucks / the installation of side guards / the installation of reflectors / limiting working hours for commercial truck drivers / records on drivers' profiles / safety measures for commercial trucks in the United States and technological advancement for truck safety.

2. Survey truck drivers' road safety behaviors, physical conditions of trucks, and usage of trucks that impacts road safety

The working team collected the data on truck drivers' road safety behaviors, physical conditions of trucks, and usage of trucks through questionnaires and interviews. The geographical coverage for fieldwork was Bangkok, Pathum Thani, Nonthaburi, Samut Prakan, Samut Sakhon, Chonburi, Saraburi, Nakhon Ratchasima, Prachinburi, Chaiyaphum, Chiang Rai, Phra Nakhon Si Ayutthaya and Uthai Thani. The three topics were explored in greater depth using survey questions listed below.

Part 1: Profiling (22 questions):

- Socioeconomic status (e.g., age, gender, education, income)
- Work experience as truck drivers (e.g., length of license obtainment, types of license currently owned, and experience maneuvering the models currently operating)
- Types and usage of trucks currently operating (e.g., types of trucks, characteristics, ownership status, operating hours, containerized goods)
- Conditions of trucks (e.g., age, distance operated, safety equipment, records on condition check-up)
- Truck driving training sessions (e.g., participation in safe driving training sessions and names of schools)

Part 2: Road behaviors (24 questions):

Road behaviors include seat belt usage; drunk driving history; speed used on the road; red light running history; tailgating behavior; parking for engine cool-down; and overtaking and decelerating behaviors.

Part 3: Drivers' opinions on regulations (9 questions):

Exploratory topics include perceptions and attitudes on traffic rules, law enforcement, and safety measures for trucks administered by the government and business owners.

Part 4: Drivers' opinions on risky driving and accident-prone behaviors (14 questions):**Part 5: Pre-departure truck condition checklist (12 questions):**

The total sample size was 1,137 trucks of different types, 211 of which were trucks used in large enterprises, 264 were of medium enterprises, and 244 were of small enterprises. Additionally, micro enterprises accounted to 301 shares of the total sample size, while 117 vehicles were trucks used in hazardous materials logistics.

3. Analyze secondary data about road accidents involving trucks and survey data from primary research**3.1 Results on the analysis of truck accident database from the Department of Land Transport and the Department of Highways**

Comparative study on the analysis of truck accident database from the Department of Land Transport and the Department of Highways revealed that night-time exacerbates the severity of road accidents as opposed to those happening during daytime. Most truck accidents have motorcycle involvements and the parity between the two vehicles often results in higher casualties, compared to accidents involving trucks and other vehicles. The most detrimental types of crashes are rear-end and head-on collisions.

Differences can be observed in the results obtained from analyzing the Department of Land Transport's and the Department of Highways' database on accident severity, types of trucks involved, and causes of accidents. The Department of Land Transport identified trailers and wheeler trucks as the factors contributing to higher accident severity, comparing to trucks

of other categories. Speeding and drowsy driving were the main causes of accidents according to the DLT. In contrast, the Department of Highways labelled six-wheeled trucks as main contributors to accident severity, with engine failure being the main cause of accidents.

3.2 Survey result analysis of truck drivers' road safety behaviors, physical conditions of trucks, and usage of trucks that impacts road safety

3.2.1 Road behaviors

Large enterprises are more rigorous than smaller enterprises in enforcing safety measures. These measures include pre-departure vehicle condition checklists, proper goods arrangement and storage, seat belt usage, and pre-departure preparation for navigation. Seat belt usage is the behavior that small and micro enterprises mostly neglect. That said, decelerating in urban areas is what smaller businesses usually comply to at a higher rate than businesses of larger size. This appropriate use of traveling speed could stem from the fact that the operations of smaller entities are usually short-distance routes and more concentrated on urban and community areas. 95 percent of large enterprises check the alcohol level of drivers before departure, signifying that drunk driving prevention is a serious matter for large corporations. Smaller businesses pay noticeably less attention to this matter. Moreover, the survey also revealed that most businesses do not consider the absence of rear-end signs for roadside pull-over that important.

3.2.2 Opinions on regulations

Compared to smaller operators, truck drivers of large corporations agree that there is a lower chance of them getting arrested for breaking the traffic laws. Going over the speed limit is the main cause of arrest for small companies. Drivers of micro businesses are more prone to getting arrested for “using mobile phones while driving,” “not putting the seat belts on,” “overloading the trucks,” and “speeding.”

3.2.3 Opinions on risky driving and accident-prone behaviors

Such issues as “checking the blind spots at the vehicle front,” “checking the blind spots on the vehicle right-hand side,” “exceeding legal continuous operating time span of 4 hours,”

and “modifying the front and rear lights” are seen as risky behaviors by less than half of large operators. The number is even lower for small and micro operators.

3.2.4 Installation of safety equipment

Over 85 percent of large operators have installed complete sets of safety equipment. The proportion is lower among medium to small operators for rear and side underrun and lowest among micro enterprises. Only 22 percent of micro enterprises install “triangle-shaped reflectors for roadside pull-over.” Among the aforementioned 22 percent, 60 to 80 percent has “side reflectors” and “rear reflectors” that are in good conditions. The reflectors play a crucial role in improving night visions, and their absence was identified by past studies as an important cause of rear-end crashes.

4. Propose guidelines on how to better regulate road safety for trucks

From secondary data analysis and field research, the working team proposes short- and long-term policy improvement as follows.

4.1 Guidelines on truck safety regulation and policy revision

Short-term policies

Side-view mirror installation

Thailand's policies on the installation of wing mirrors are not yet well-defined, whilst most truck drivers still do not believe that failure to check the blind spots will translate to higher risks of severe accidents. The working team thus recommends the revision of trucks' side-view mirror policy by reinforcing all trucks to install the mirrors. This would allow the drivers to monitor for blind spots throughout the whole vehicle body.

Side guard / underrun guard / underride guard installation

From current physical condition examination, a high number of trucks do not have safety gears set up at appropriate places. It is advisable for pickup and other types of trucks to thus install side / underrun / underride guards for safety. An exception of side guard installation

is to be granted for certain types of trucks (e.g., concrete mixer trucks, garbage trucks, and fire engines).

Q-Mark certification for standardized quality and service of commercial truck logistics

Getting Q-Mark certification from the Department of Land Transport would uplift the quality and service standard of commercial truck operations and is highly recommended for medium to small operators. Benefits from the certification for these operators could also possibly be added.

Reinforcing the installation of rear reflectors and of triangle-shaped reflectors for roadside pull-over

Regulations regarding the installation of rear reflectors for all types of trucks should be tightened to increase visibility, especially for micro operators who often have unclear reflective signs. Trucks with canvas cover should also install additional equipment for better visibility, as this type of trucks is not yet controlled by laws to have reflectors that meet the safety standard installed.

Long-term policies

Electronic stability control

The electronic stability control computer technology enables drivers to keep full control of the vehicles for acceleration and deceleration under challenging circumstances. The purpose of the technology is to minimize crashing possibilities. Heavy trucks are thus recommended to employ the electronic stability control system to prevent crashes and slides and to increase road grip. Preliminary installation could start with trucks with extremely heavy loads.

4.2 Guidelines on truck drivers' safety regulation and policy revision

Short-term policies

Evaluation on truck drivers' readiness for work

Long and continuous working hours of truck drivers could be one of the causes for accidents. In addition to keeping the hours grounded within the acceptable range, allowing for

enough rest time is also crucial. Though unaware of it, some drivers experience sleep deprivation conditions, for example, those caused by obstructive sleep apnea. The symptoms interrupt sleeping patterns by completely or partially obstructing the airway during sleep, resulting in repetitive involuntary wakefulness. Those with obstructive sleep apnea often experience fatigue, despite the impression that they have had enough sleep. Studies have found that patients with these conditions—though having fulfilled the recommended 8-hour sleep duration—are reportedly less fresh and awake than those who have had uninterrupted 4-hour slumber sessions. This, therefore, could be an important factor leading to truck accidents.

Exhaustive physical condition assessment of truck drivers by specialized medical personnel should thus be conducted to gauge whether the drivers are fit enough to maneuver the commercial vehicles.

Content enhancement of truck driving training session

Survey results clearly exhibit the fact that most truck drivers lack the risk perception skills in identifying risky behaviors that could cause severe accidents. Roadside pull-over could cause violent rear-end crashes. Negligence of front and right-hand side blind spots could lead to crashes with motorcycles and other smaller vehicles frequently shielded by the visual field obscuration. Driving continuously and without rest for 4 hours straight could result in severe accidents from drowsy driving, while modifications of front and rear lights could impair night visions of fellow road users.

To increase the mindfulness of truck drivers regarding these risky behaviors, training sessions for truck driving should add related content into the curriculum, especially during driver's license renewal training or while interacting with policemen after violating the traffic laws. Large enterprises could also revise their internal road safety training curriculum to cover such content as well.

Strictly reinforcing the traffic laws and increasing the penalties

Survey results clearly exhibit the fact that most truck drivers neglect the traffic laws such as roadside pull-over with the absence of rear-end signs, driving continuously and without rest for longer than 4 hours straight, using mobile phones while driving, and most (70-80 percent) drivers' belief of lower chance of getting arrested for breaking the traffic laws.

This implies the currently weak enforcement of traffic laws. Therefore, the strict enforcement of traffic laws should be obtained. The penalties associated with the traffic laws should be increased especially for the risky driving behaviors potentially contributing to severe traffic accidents such as speeding, driving continuously and without rest for longer than 4 hours straight, the absence of rear-end signs for roadside pull-over, modifications of front and rear lights that could impair night visions of fellow road users, and the installation of side reflectors and rear reflectors that are in poor conditions.

Long-term policies

Driver fatigue monitoring system

A variety of options have been developed by multiple global inventors to prevent drowsy driving, incorporating such technology as steering wheel cameras, eye-tracking inventions, surveillance cameras for car interiors, and glasses with sensors targeting drivers' eye movements. On-field research unveiled higher-than-average concentration on the road among drivers whose companies employ the use of such technology. The adoption of the driver fatigue monitoring system is thus recommended for other operators in Thailand.

Records on drivers' profiles

Logistics service providers should keep up-to-date records of their truck drivers' profiles. Even though a thorough database of drivers' profiles is already employed among medium to large enterprises, small and micro operators still need to improve in this region. The working team therefore recommends the centralization of the database, assembled by the Department of Land Transport. The database should display truck drivers' personal information and driving experience, with a scoring system and penalties for drivers who violate the traffic law (e.g., speeding and drunk driving). Access to the database should be granted to both the employers and the employees alike.

4.3 Guidelines on road safety regulation and policy revision

Improvement of truck rest areas

Land Transport Act 2522 B.E., Section 103 cited that “under the labor protection law concerning a 24-hour driving operation, drivers—granted with commercial transportation licenses—should not drive continuously for more than 4 hours counting from that start of the operation. Nevertheless, once the drivers have undergone a minimum of 30-minute resting period, the drivers are permitted to continue with the operation for 4 more hours.” Practicality, truck drivers in Thailand cannot fulfil the resting period regulations due to the absence of standardized truck rest areas that could accommodate heavy-load trucks along the main logistics routes nationwide. This often leads to truck drivers pulling over on the roadside to complete the legal resting milestones—contributing to accident occurrence. The short- and long-term solutions to this problem are available as follows.

Short-term policies

To minimize accident occurrence, loss, and damage and to facilitate convenient transportation by allowing drivers to rest safely and effectively, the department should first provide temporary truck rest areas for truck drivers along the main commercial transportation routes. The availability of the new temporary rest areas should be advertised to truck drivers to promote widespread usage, targeting especially the areas with sizeable operation volume.

Long-term policies

The construction of truck rest areas along the main commercial routes will decrease accident counts and mitigate collateral damage from drivers' fatigue and roadside resting. Appropriate resting areas that are safe and effective will elevate the quality of the country's land transport logistics management. The Office of Transport and Traffic Policy and Planning is researching the development of truck rest areas along the main highways and is now drafting long-term blueprints. The new sites will be constructed as per the quality standard and in alignment with current and future truck drivers' safety demands. Locations of the resting areas should correlate with drivers' resting patterns to promote full compliance to the law. Necessary facilities as per the required standard should also be provided.