การสำรวจความคิดเห็นของผู้มีส่วนร่วมต่อสภาพความปลอดภัยของการเดินทางไปทำงานของคนงานสิ่งทอและรองเท้าในกรุงพนมเปญ

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ปีการศึกษา 2559

A SURVEY OF STAKEHOLDERS' OPINIONS ON SAFETY CONDITIONS OF COMMUTING TRIPS OF GARMENT AND FOOTWEAR WORKERS IN PHNOM PENH

Mr. Narith Saum

A Thesis Submitted in Partial Fulfillment of the Requirements
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นาริท ซวน : การสำรวจความคิดเห็นของผู้มีส่วนร่วมต่อสภาพความปลอดภัยของการเดินทางไปทำงานของคนงานสิ่งทอและรองเท้าในกรุงพนมเปญ (A SURVEY OF STAKEHOLDERS' OPINIONS ON SAFETY CONDITIONS OF COMMUTING TRIPS OF GARMENT AND FOOTWEAR WORKERS IN PHNOM PENH) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: รศ. ดร. จิตติชัย รุจนกนกนาฏ, 125 หน้า.

การสัญจรด้วยยานพาหนะของคนงานสิ่งทอและรองเท้าในยานพาหนะแบบต่างๆ ด้วยความแออัด ได้แก่ รถตู้ รถบัส การนั่งท้ายรถบรรทุก และแคร่ยาวท้ายจักรยานยนต์ ในประเทศกัมพูชาถือเป็นการเดินทางรายวันที่เสี่ยงอันตรายและส่งผลให้เกิดอุบัติเหตุร้ายแรง การเข้าใจความคิดเห็นของผู้ที่มีส่วนเกี่ยวข้องเกี่ยวกับการสัญจรในรูปแบบเหล่านี้และสาเหตุของอุบัติเหตุทางถนนที่เกี่ยวข้องจะมีส่วนสำคัญอย่างยิ่งในการสร้างมาตรการความปลอดภัยทางถนน ผู้วิจัยได้สำรวจความคิดเห็นของผู้ที่มีส่วนเกี่ยวข้อง 4 กลุ่ม คือ คนงาน 155 คน พนักงานขับรถคนงาน 80 คน และคนขับรถอื่นๆ 80 คน และผู้แทนจากโรงงานสิ่งทอและสหภาพแรงงาน 5 คน ในส่วนของแบบสอบถามคนงานและพนักงานขับรถคนงานนั้นประกอบด้วย 3 ส่วน คือข้อมูลทางเศรษฐสังคม ลักษณะการขับขี่หรือการสัญจร และความคิดเห็น ขณะที่คนขับรถอื่นๆและผู้แทนจากโรงงานและสหภาพนั้นได้สอบถามเพียงความคิดเห็นเท่านั้น ข้อมูลที่ได้นำมาประมวลผลโดยใช้แบบจำลองทางสถิติ โดยฝั่งคนงานนั้นได้พิจารณา ความคิดเห็นในส่วนความรู้สึกปลอดภัย ความพึงพอใจในการสัญจร และความเต็มใจที่จะจ่ายค่าโดยสาร ขณะที่ส่วนของพนักงานขับรถพิจารณาในส่วนความคิดเห็นต่อค่าโดยสาร และความคิดเห็นต่อการบังคับใช้กฎหมาย แบบจำลองที่ใช้คือสมการถดถอยเชิงเส้นทั่วไปและสมการถดถอยเชิงลำดับโดยใช้โปรแกรมสถิติ STATA นอกจากนี้ ผู้วิจัยได้วิเคราะห์อุบัติเหตุ 30 ครั้งที่เกิดขึ้นที่เกี่ยวข้องกับการสัญจรของคนงานด้วย ผลการสำรวจที่ได้นำมาซึ่งแนวทางในการสร้างความปลอดภัยทางถนน ทั้งในส่วนของระบบการจัดการและกฎหมาย การฝึกอบรมและประชาสัมพันธ์ มาตรฐานยานพาหนะที่ปลอดภัย การบังคับใช้กฎหมาย ตลอดจนการปรับปรุงโครงสร้างพื้นฐานทางถนน

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Commuting by vehicle of garment and footwear workers in Cambodia has been recognized as daily dangerous trip, resulting in serious accidents of their crowded vehicles including vans, buses, flatbed truck, and long-tailed remorks. Understanding stakeholders' opinions about this commuting mode, and the causes of traffic accidents are very important for proposing road safety remedies. Stakeholders (155 workers, 100 drivers, 80 general drivers, and 5 representatives from factory and labor unions) were interviewed with questionnaire sheets which were divided into three parts such as socioeconomics, and driving/commuting characteristics, and opinions. However, only opinion part is used for interview with general drivers and representatives. From these data, some statistical models are constructed from both passenger side (safety concern, commuting satisfaction, and willingness-to-pay) and driver side (fare characteristics and perception towards law enforcement). Ordinary least square and ordered regression are used to construct these models under the aid of a statistical software package, STATA. In addition, 30 serious accidents were recorded for cause analysis. Finally, some road safety measures are proposed in term of management system and regulation, training and disseminating, safe vehicle, traffic law enforcement and road infrastructure.

Department: Civil Engineering Student's Signature .....

Field of Study: Civil Engineering Advisor's Signature .....

Academic Year: 2016

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Chapter 1

INTRODUCTION

1.1 Introduction

Cambodia is a country located in Southeast Asia bordering to Laos, Thailand, Vietnam, and Gulf of Thailand. Cambodia has total landmass of 181, 035 square kilometer and divide into 24 provinces and a capital, Phnom Penh. The Cambodian economy has rapidly grown with the average of 7% since 2012, and are expected to maintain these growth until 2018. The leading sectors which support these economic growth are textile industry, construction, agriculture and tourism. Since 1994, Garment and footwear industry plays a pivotal role in Cambodia's economic in term of revenue generation, and creation of employment. This industry has the export value exceed $6 billion US, accounting for 80 percent of total national export volume in 2015. The average growth of this sector is 15 percent in term of employment, export value, or registered factories since 2010. The growth has been driven by foreigner's investment, attracted by low labor cost, quota hoping, and incentive for export-oriented investors like duty free imports, tax holidays and tax incentive. Around 90 percent of investors are forefingers from China, Taiwan, and South Korea, while it mainly exports to European Unions, and United States. At the end of 2015, there are 699 garment and footwear factories which employ more than 620,000 workers, 86 percent of whom are women (ILO, 2016).

Figure 1.1 Transportation of garment and footwear workers (left: flatbed truck, right: long-tailed remork)

Commuting mode of garment and footwear workers can be divided into three main modes such as walking, motorcycle, and public vehicles in the distance up to 60km. Based on rough estimation, if the factory locates in the urban area, workers commute to workplace by walking (70%), motorcycle (20%), and public vehicle (10%). On contrary, if the factory locates in suburb or provincial area, the percentage of each mode are about 10%, 20% and 70% respectively. There are many types of vehicles used to transport workers, but we group them into 5 modes based on their similarity, size, and percentage of population such as vans, buses, small flatbed trucks (allowable load 1-1.5ton), medium flatbed trucks (allowable load 2-2.5 ton), and long-tailed remorks. Based on NSSF, there are about 4,000 (3591 in the report 2013) worker-transporting drivers, who ferry the workers from their home to various factories. So there are about 150,000 to 250,000 workers who daily commute by these vehicle modes.

1.2 Problem Statement

These commuting vehicles gain their popularity because of its low cost, door-to-door, and lack of public transit. Without specific controlling system and regulation, this commuting mode produces some serious problems, especially road safety. Therefore, dozen are killed and another hundreds are injured annually because of overload standing passengers, speeding or overtaking, untrained drivers, drunk drivers, inappropriate quality of vehicles and poor road condition. In this context, there are both national and international news agencies broadcasting these problems such as Aljazeera: Cambodia's killer commute, Vice News: transport like pigs, Phnom Penh Post: when a risky road is the only option, and VOD: my safety worth $7...etc.

To deal with traffic accident, government of Cambodia have approved the Decade of Road Safety 2011-2020 of United Nations (UN) in order to reduce traffic fatalities and injuries by 50% by 2020, and to provide safe, affordable, accessible, and sustainable transportation system by 2030. Specifically to private sector, government require all private enterprises/establishments with more than 8 employees to register at and pay

contribution to National Social Security Fund (NSSF), which will be responsible for work and commuting related accident including treatment and other benefits. For commuting accidents, this organization has cooperated with others ministries, labor unions, employer association, some international organizations to create a team, Road Traffic Safety Team for Worker Prevention (RTSTWP), which has the duty to collect related data and analysis the causes of traffic accidents. Moreover, RTSTWP has done some actions such as training worker-transporting drivers traffic law and vehicle inspection; preparing driving examination and providing driving license, disseminating about traffic law and first-aide to workers and trainers; raising awareness of traffic accident, collecting data about worker-transporting drivers, assisting workers suffering from road accident (RTSTWP, 2016). The combination of these actions of RTSTWP and new traffic law in 2016 have reduced the workers' commuting accidents by 14%, workers' commuting fatalities by 27%, and serious injuries by 9%, but increase the minor injuries by 3%.

Even there are both warning and supports from the government, serious traffic accidents of these commuting vehicles are still frequently occurred, and the regulations are yet enforceable. Therefore, understanding the characteristics of workers and drivers, the opinions of all stakeholders about this commuting mode, and the characteristics of accident causes are very important for proposing policies to improve this commuting mode.

1.3 Objectives

This research has two objectives as following:

1. Understand the opinions and recommendations of stakeholders relating to problems on the commuting of garment and footwear workers.
2. Prioritize Cambodian government strategies to reduce traffic accidents and increase commuting comfort and safety for garment and footwear workers.

1.4 Hypothesis

To achieve the goal of this research, we will do some regression models against some personal characteristics and commuting or driving characteristics. From garment and footwear workers, we want to construct the model of Safety Concern Model, Overall Commuting Satisfaction Model, and Willingness-to-Pay Model against socioeconomics characteristics, and commuting characteristics. Similarly, Stricter Traffic Law Enforcement Model (Limit passengers on vehicle, stricter driving license, stricter technical check, and stricter drink-driving) will be generated in function of worker-transporting drivers' socioeconomic and driving characteristics. In addition, total fare revenue, the multiple of average fare revenue per person and average number of passengers on vehicle, will be constructed to understand some inside information of current commuting condition.

For worker-transporting drivers, total fare revenue generally depend on distance, and vehicle type, but we will also test this model against some other driving characteristics and socioeconomics as well. We can simply said longer driving distance, and more number of passengers on each vehicle type will have to higher total fare revenue. This model will give us some information that might also affect the driver's perception toward stricter traffic law enforcement, especially the factors which has strongly impact to their revenue. Some other important factors that might also have the relationship with the drivers' perception are age, frequency of drink-driving and police stop, experienced to traffic accident, and fare paid by factory.

Similarly, workers' concern about road safety and overall satisfaction might be affected by bad driving performance, speeding, standing during commuting, worse vehicle & road condition, crowding, and experienced to vehicle's problems and traffic accident. Higher income, elder people and long commuting distance or time will rate their concern or dissatisfaction high. However, they will feel less concern and dissatisfied if their factory and authority pay more attention on their commuting's problem like training them or their drivers about traffic law, commuting safety...etc. On the other

hand, we think that people commuting by buses, vans, medium flatbed trucks, small flatbed trucks, and long-tailed remorks will have lower safety concern and dissatisfaction respectively. Finally, their willingness-to-pay model will be also generated to reveal the aspects that workers want to improve.

1.5 Scope

The scope of this research will be focused on public transportation modes, i.e., vans, buses, small flatbed trucks, medium flatbed trucks, and long-tailed remorks, of garment and footwear workers in the metropolitan area of Phnom Penh. The data collection will be done across factories size (based on the number of workers). The selected factories are situated in Phnom Penh, Kandal province and Kompong Speu province, where about 95 percent of garment and footwear factories are.

1.6 Brief Methodology

To fulfill the research's objectives, we have to follow the research steps as follows:

1 Literature review and background of data collection: In this step, we will review the past researches related to this thesis. Then, we design the questionnaire and analysis method. Because we focus on all stakeholders, so the questionnaire will be designed separately. For worker-transporting drivers, there are 30 questions which divided into three parts, [1] socioeconomics, [2] driving characteristics, and [3] drivers' opinions. Similarly, there are 31 questions for workers which separate into 3 parts, namely [1] socioeconomics, [2] commuting characteristics, [3] workers' opinions. Moreover, we also design some questions to get some opinions about this kind of commuting mode from the general drivers.

2 In-depth interview of employers and labor union: we will interview the employers and labor union to know their opinions on commuting condition of their workers or members.

3 Questionnaire survey: The questionnaire survey and in-depth interview will be done randomly in the metropolitan area of Phnom Penh (Phnom Penh, Kompong Speu and Kandal Province).

Table 1.1 Research plan

Items\Date (Month/Year)	3/16	4/16	5/16	6/16	7/16	8/16	9/16	10/16	11/16	12/16	1/17	2/17	3/17	4/17	5/17	6/17	7/17
1. Literature review and background data collection	←	—	—	—	→												
2. In-depth interview of employers and association						←	—	—	—	→							
3. Questionnaire survey						←	—	—	—	—	—	→					
4. Data analysis								←	—	—	—	—	—	—	→		
5. Policy recommendation												←	—	—	—	→	

4 Data analysis: The descriptive statistics will be done on the data from the questionnaire. This data will be stored in a statistical program, STATA, and will be generated the objective models based on regression analysis. Since our objective models are both continuous and ordered variables, so OLS and ordered probit regression will be used to estimate these models, [1] total fare revenue, [2] law of limiting number of passengers on vehicle, [3] stricter driving license, [4] stricter vehicle's technical check, [5] stricter drink-driving, [6] safety concern, [7] commuting satisfaction, and [8] willingness to pay. Moreover, the causes of commuting accident of these vehicles which were recorded form national and international news agencies, will be summarized into three related causes (drivers, vehicle, and infrastructure).

5 Policy recommendation: Finally, we will prioritize some recommendation policies in order to improve the traffic condition of garment and footwear workers in the metropolitan area of Phnom Penh.

Chapter 2

LITERATURE REVIEW

2.1 General Overview of Garment and Footwear Industry in Cambodia

2.1.1 General Background of Cambodia

Cambodia, officially known as the Kingdom of Cambodia, is a country located in Southeast Asia with the total landmass of 181,035 square kilometer, bordering with Thailand, Laos, Viet Nam and Gulf of Thailand. Cambodia has divided into 25 provinces, including the capital Phnom Penh (see Figure 2.1). Cambodia's climate, like that of the rest of Southeast Asia, is dominated by monsoons, which are known as tropical wet and dry because of the distinctly marked seasonal difference. The rainy season runs from May to October and the dry season lasts from November to April. The temperature in Cambodia varies from 18 to 38 °C (Wikipedia, 2016).

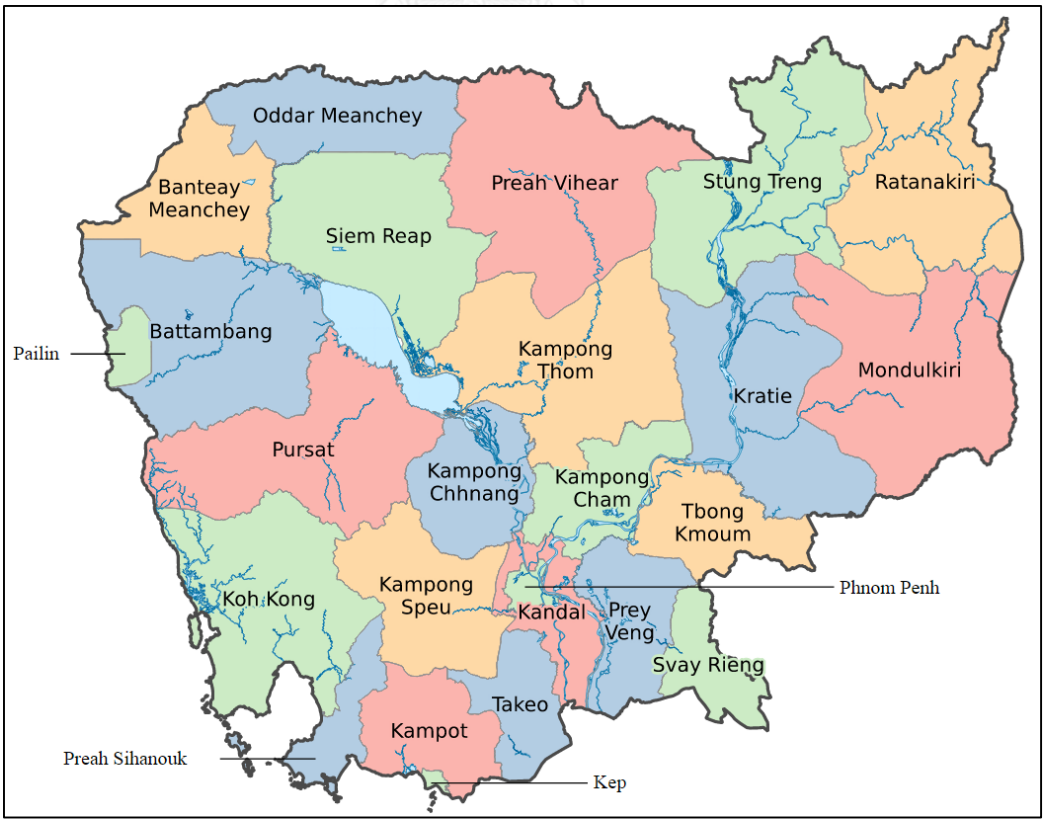

Figure 2.1 Provincial map of Cambodia (Wikipedia, 2016)

By the end of 2015, the total population of Cambodia was estimated to be 15.9 million with the annual increasing rate about 1.7%. The pyramid population of Cambodia (see Figure 2.2) illustrates the age and sex structure and may provide insights about political and social stability, as well as economic development. Otherwise, the age structure also affects a nation's key socioeconomic issues. For example, the country with young populations (age under 15) need to invest more in school, while with older population (age above 65) need to invest more in health sector. From the Figure 2.2, we can see that the active population (from 15 to 65 years old) represent 64.5 percent of the total and also provide a sustainable labor force. However, the Kingdom also face to high unemployment rate, 0.4% (inappropriate methodology) to the total labor force in 2014 (WorldBank, 2014). As the result, this labor force immigrate both legally and illegally to other countries to find job such as Thailand, Korean, Malaysia...etc.

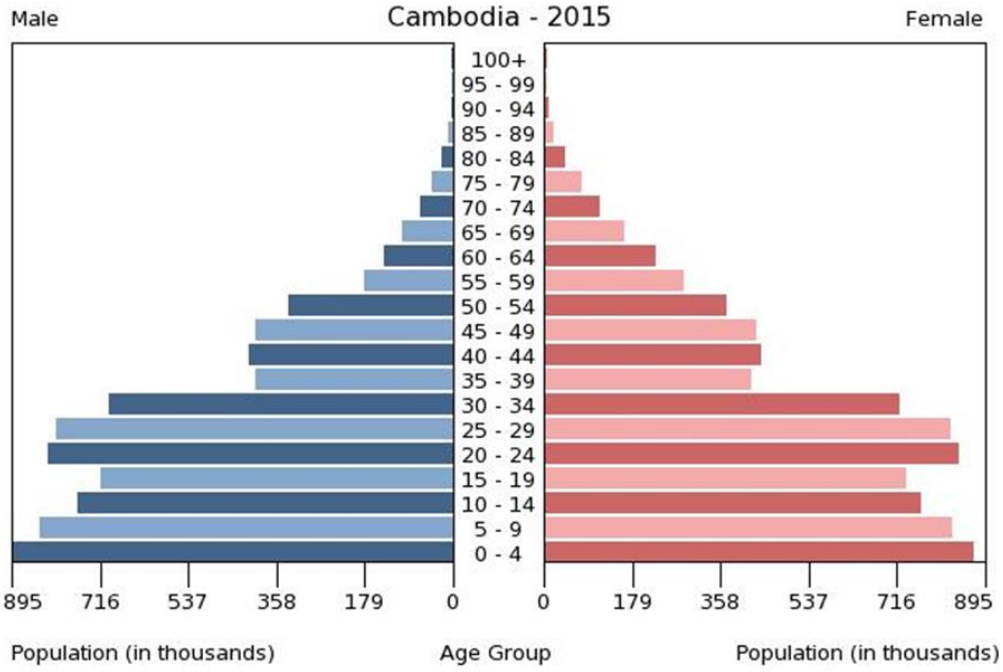

Figure 2.2 Cambodian population in term of age and sex in 2015 (CIA, 2016)

The Cambodian economy enjoyed the rapid annually growth with the average of 7% since 2012; and are expected to maintain this growth until 2018. According to the Ministry of Economy and Finance, the real Gross Domestic Product (GDP) of Cambodia

growth is estimated at 7.4% in 2013, 7% in 2014, and 7% in 2015, with the GDP's value of $15.35, $16.91 and $18.61 respectively. The leading sectors which support this economic growth are garments, construction, agriculture and tourism. Cambodia's production structure is balanced between agriculture, industry, and services. Agriculture's share of national output has declined, falling from half of national output in 1995 to 34% in 2013. During the same period, industry's share rose from 15% to 26% (75% (2010) are garment and footwear industry) and the services from 36% to 41% (ADB, 2014).

Table 2.1 Summary of socio-economic characteristics (ADB, 2014)

Year	2013	2014	2015	2020
Population (Million)	15.1	15.3	15.6	16.9
GDP per Capita ($)	1043	1130	1225	1600
GDP Growth (%)	7.4	7.1	7	7
Unemployment rate (%)	0.3	0.43	0.3	0.14

2.1.2 Garment and Footwear Industry in Cambodia

Cambodian Garment Industry started in 1993 when foreign investors started to venture into Cambodia. With the granting of MFN/GSP trade privileges to Cambodia in 1996 by both the USA and EU, garment industry has maintained its preeminent position in the industrial landscape of Cambodia. The Number of garment and footwear factories has grown from 48 in 1996 to 699 in 2015 with total export value exceeding USD6 billion (see Figure 2.4). These two industries export account for approximately 80% of Cambodian's total export and foreign trade. Moreover, there are more than 620,000 workers who worked in this sector, and as much as 86 percent of whom are women (see Figure 2.3), (GMAC, 2015; ILO, 2016).

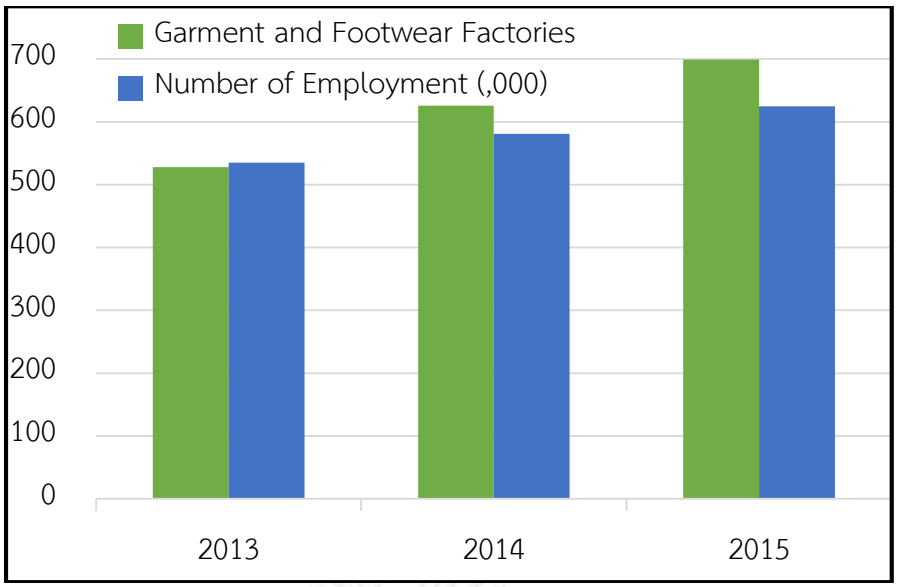

Figure 2.3 Garment and footwear factories and employment (ILO, 2016)

The continued growth of garment and footwear exports is driven mainly by strong demand from European buyers. The average growth of this sector is 15% in term of employment, export value, and registered factories since 2010. In 2014, exports of garment and footwear to European Union rose by more than 27 percent, while exports to the United States declined by 6 percent (see Figure 2.4). As the result, the European

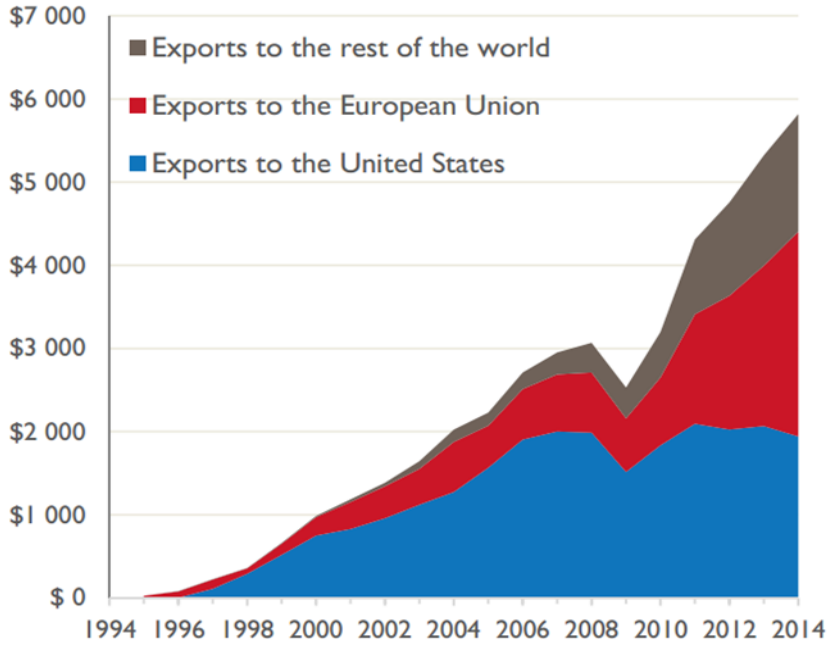

Figure 2.4 Cambodia's garment and footwear exports by main destination (ILO, 2015)

-Union became the single biggest destination for Cambodia's garment and footwear exports and now counts for 42 percent of total export volume. This input ahead of the United States, traditionally the main market, with a share of 34 percent. The remaining 24 percent of Cambodian garment and footwear exports in 2014 was shipped to the rest of the world, mainly Canada and Japan (ILO, 2015). However, Cambodia's Industrial Development Policy 2015-2025 aims to broaden the industrial base further by diversifying and increasing exports of manufactured products other than garments.

Base on the data from GMAC on March 24, 2016, we can classify the factories size by the number of workers (see Table 2.2) with the average of 840 workers. So, most of Cambodian factories are small and low medium category in size compare to Vietnam and Bangladesh. Most of investors in this sector are foreigners with over 93% coming from China, Taiwan, Korea, Hong Kong and Japan (see Figure 2.5). In addition, it is estimated that approximately 60% of garment factories are located within a 30 kilometer radius from Phnom Penh. More generally, most of the textile and garment industries are located in Phnom Penh, Kompong Som, Kompong Speu, Kompong Cham, Kompong Chhnang, Svay Rieng, Takeav and Kandal province (see Figure 2.6) (EuroChamCambodia, 2014).

Table 2.2 Factories Size based on number of workers (GMAC, 2016)

Number of Worker	Garment and footwear factories	
	Number	Percent
<500	335	50.53
500 - 1000	154	23.23
1000 - 2,000	111	16.74
2,000 - 5,000	54	8.14
>5,000	9	1.36

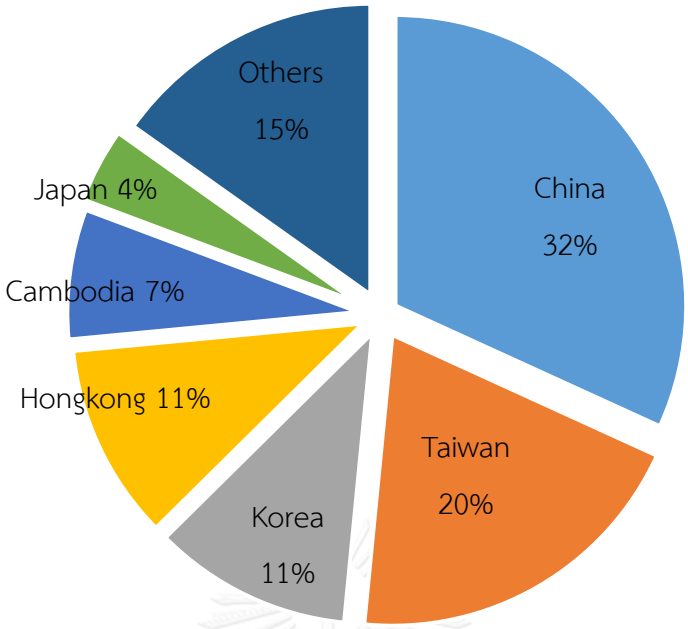

Figure 2.5 Factory ownership by nationalities (GMAC, 2016)

Figure 2.6 Distribution of garment and footwear factories in Cambodia (EuroChamCambodia, 2014)

2.2 Commuting Condition of Garment and Footwear Workers

2.2.1 Overview of Commuting Condition of Garment and Footwear Workers

In the past, garment and footwear factories mostly located in the urban area of Phnom Penh, so commuting was not a big problem, and most researchers focused on health status, workplace harassment, personal safety...etc. For example, Chiek (Chansomphors, 2008) had studied about the garment workers main basic living requirements such as food, health, housing, utilities, and transportation. She found that commuting is not big concern since the distance in not far which they commute to workplace by walking or long-tail remork, but they faced difficulty in returning home during some important holidays. In 2014, National Institute of Public Health (NIPH, 2014) aimed to understand workers' health seeking behavior linked to, knowledge and perceptions of RMNH issues (reproductive, maternal and neonatal health) such as sexual activity and contraceptive use, pregnancy and maternal health, and abortion and post-abortion care. At the same year, United Nations Population Fund (UNFPA, 2014) reviewed existing literature to better understand some key issues such as reproductive and maternal health, family planning, abortion, gender-based violence, STI's and HIV/AIDS. Similarly, Ms. Veu (Kanitha, 2016) examined some factors (socioeconomics, living condition...etc.) affecting sexual and reproductive health.

However, in the last several years, garment and footwear factories has relocated to suburb of Phnom Penh or provincial areas, Special Economic Zones or Industrial Parks, due to many reasons such as industrial deconcentration policy to reduce traffic congestion in CBD, lower labor wage, cheaper land rent, and supported facilities by government at those SEZs/IPs. Shorter distance between factory and home, road improvement, and greater number of worker-transporting vehicles encourage workers to choose daily commute between home and workplace other than renting rooms nearby the factory. There are also some other reasons such as cultural condition (parents don't allow their daughters to live away from home), high daily expense, bad condition and insecurity of rental room, working on their farm during off day, and taking care of their children.

Commuting mode of garment and footwear workers can be divided into three main modes such as walking, motorcycles, and public vehicles (see Figure 2.7). Based on our rough estimation, if the factories locate in the urban area, workers commute to workplace by walking (70%), motorcycle (20%), and public vehicle (10%). On contrary, if the factories locate in the suburb or provincial area, the percentage of each commuting mode are about 10 percent, 20 percent, and 70 percent respectively. In this research, we study only the public vehicles modes because of several reasons. First, vulnerable pedestrians are mostly young and elder people, i.e. young pedestrians (below 15) and elder pedestrians (above 40) shared about 74% of total pedestrian fatalities (NRSC, 2015). Moreover, there are some academic studies (Chowdhury, Rifaat, Shahriar, Al Noman, & Habib, 2015; Hoque, Debnath, & Mahmud, 2006; Shumi, Zuidgeest, Martinez, Efroymson, & van Maarseveen, 2015) in Bangladesh about walking condition of garment workers which are very useful Cambodia. In other hand, there are also few academic researches, studying about behavior of motorcyclists in Cambodia (Brijs et al., 2014a; Roehler et al., 2013) which contributed deep understanding about the characteristics of motorcyclists. Even these commuting vehicles are quite similar to other informal public transportation in other Asian countries like Songthaew in Thailand or Jeepney in Philippines, there are some major different characteristics such as law and regulation, trip characteristics, and workers/drives' attitude toward commuting safety. So, lots more studies about the characteristics of this commuting mode are necessary for improving the current commuting, especially safety.

Base on National Social Security Fund, there are around 4000 worker-transporting drivers (3591 in 2015 annual reports), so there are around 200,000 workers who commute to workplace by these public vehicles (see Figure 2.7). NSSF classified these vehicles into five modes including long-tailed remorks, vans, small flatbed truck (1-1.5T), medium flatbed truck (2-2.5T) and large flatbed truck (3T) (see Table 2.3). However, we group them into five modes (based on their similarity, size) such as vanes, buses, long-tailed remorks, small flatbed trucks (allowable load 1-1.5 ton), and medium flatbed trucks (allowable load 2-2.5 ton) as shown in Figure 2.7.

Figure 2.7 Commuting vehicles of garment and footwear workers in Cambodia: (a) van, (b) long-tailed remork, (c) flatbed truck, and (d) bus

Table 2.3 Percentage of vehicle by transportation modes and average passengers capacity (NSSF, 2014)

Kind of transportation modes	Number of Vehicle	Percent (%)	Average Passengers Capacity
Tuk Tuk / Motoromork	217	11.62	45
Van	470	25.17	40
Small Flatbed Truck 1 – 1.5 Ton	936	50.13	50
Medium Flatbed Truck 2 – 2.5 Ton	210	11.25	75
Large Flatbed Truck 3 Ton	34	1.82	100
Total	1,867	100	-

Most of these divers collect commuting fare from workers, so they transport workers for several factories. Only few of them get the payment from factories with several kinds of payment method such as payment per worker per month, payment per trip,

and payment per month while the payment depend on distance, vehicle mode, and number of passengers on vehicle. The law requires all factories to provide commuting benefits at least $7 per month. General characteristics of these vehicles are summarized as following:

1. Van: it has about 13 to 15 seats, but these original seats are mostly replaced by news kind of seats which allow to transport up to 40 passengers (see Figure 2.7 (a)).
2. Bus: It has about 25 to 35 seats, and its original seats are mostly replaced by news kind of seats which allow to transport up to 70 passengers (see Figure 2.7 (d)).
3. Long-tailed remork: composing of two parts, long cart connecting to motorcycle (see Figure 2.7 (b)). This vehicle is quite slow and transport workers in short distance, around 5km. Some drivers used it to transport general passengers as well.
4. Flatbed truck: we group them into two modes: small mode which has the allowable load from 1-1.5 ton, and the medium size has the allowable load from 2-2.5 ton. Most of passengers stand during commuting (see Figure 2.7 (c)).

2.2.2 Commuting's Problem of Garment and Footwear Workers

Lack of supported public transit has seriously affected the low income people who can't afford private transport. So, they have to used informal public transportation because of its reasonable cost called laissez-fare, and door-to-door service. Informal public transport is defined as all common mobility that privately operate, and failed to meet the regulations of public transport sector (Cervero, 2000). This commuting mode is usually not considered desirably by decision-takers, planners, and in some case, even their customer base, so it will produce unwanted outcome as well (Shittu, 2014). Through the definition, garment and footwear workers' commuting vehicles should be classified in this mode, informal public transportation, and commuting safety is the most concern. In this case, dozen are killed and other hundreds are wounded during morning and evening commuting to and from workplace annually. NSSF has found some challenges in this commuting mode such as:

- Most drivers were not under management of the enterprises/establishments
- A handful of road users didn't obey the Traffic Law

- Some drivers have not had the driving license, and inappropriate driving license
- Some drivers were not trained in driving school
- Drivers' awareness in relation to the Traffic Law was limited
- Some drivers are young (below 25 years old), and often drunk before driving
- Some drivers didn't check their vehicles regularly
- Most of drivers use flatbed truck to transport workers
- Most of worker-transporting vehicles are overload, ageing, illegally designed, and don't have enough registration document (registration plate, technical check...etc.).

Therefore, there are both local and international news agencies broadcasting this problem. Khmer Times, Vice News and Aljazeera described about this commuting condition and interviewed with all stakeholders including workers, labor union, and authority to know about their concern and their plans to solve this problem (Julia & Khuon, 2014; Mom & Sivutha, 2015; Parkinson, 2015). Similarly, Meta and Baliga also described the condition of this commuting mode in Phnom Penh Post (Kong & Balliga, 2016). Moreover, VOD created a 10-minute video about this commuting mode under the title of "My safety worth $7" (VOD, 2015). In addition, there are also some serial programs discussing about the problem and solution for this commuting mean by Pnn Tv, Bayon Tv, VOD, and Vayo FM Radio.

2.2.3 Solutions of Commuting Problems of Garment and Footwear workers

To deal with the traffic accident, the government of Cambodia approved the Decade of Road Safety 2011-2020 of United Nations (UN) in order to reduce traffic fatalities and injuries by 50% by 2020 (see Figure 2.8), and to provide safe, accessible, affordable and sustainable transportation system by 2030. To achieve the goal of reducing traffic fatalities, National Road Safety Committee (NRSC) proposed 8 national pillars namely road safety management, infrastructure, safe vehicle, road user behavior, post-crash care, driving license, vulnerable road users, and traffic law legislation and enforcement

(NRSC, 2013). For instant, Cambodia just issued new traffic law on the January 1st, 2016 which reduce traffic accident by 12%, road fatalities by 15%, and injuries by 7%, helping Cambodia to win the Prince Michael International Road Safety Award in safer road users content (AKP, 2016).

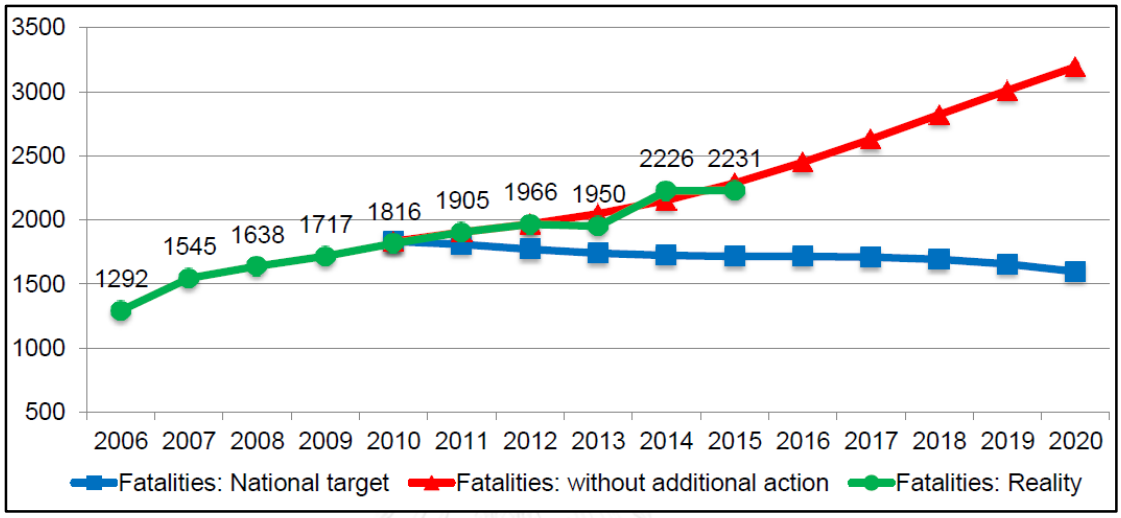

Figure 2.8 Estimated number of traffic fatalities 2011-2020 in Cambodia (NRSC, 2015)

Specific to private sector including garment and footwear workers, the government require all private enterprises/establishments with more than 8 employees to register at and pay the contribution to National Social Security Fund (NSSF). Then, NSSF will responsible for workplace and commuting related accidents including treatment and other benefits. In this case, NSSF have cooperated with other ministries, labor unions, employers association, and some international organizations to create a team, Road Traffic Safety Team for Worker Prevention (RTSTWP), which has the duty to collect related accident data, and analyze the cause of accidents. Moreover, RTSTWP have done some actions such as training worker-transporting drivers about traffic law and vehicle inspection; preparing driving examinations and providing driving licenses, disseminating about traffic law and first-aid to workers and trainers; raising awareness of traffic accident, collecting data about workers-transporting drivers; assisting workers suffering from road accident. The combination of these actions and the new traffic law in 2016 have reduced the workers commuting accidents by 14%, commuting fatalities by 27%, and serious injuries by 9%, but increase the minor injuries by 3% (RTSTWP,

2016). Moreover, RTSTWP have proposed some remedies and actions for this commuting mode of garment and footwear workers as following:

- Facilitate the enterprises/establishments to record background of worker-transporting drivers and issue ID card for them.
- Urge the worker-transporting drivers to attend the driving training course, take the driving exam and receive driving license in order to take a responsibility for their profession, and check their vehicle regularly.
- Urge the drivers to adequately equip the accessories for their vehicles with proper technics.
- Increase the dissemination programs for the drivers and workers on traffic law
- Provide the incentive to the drivers and workers who obey the traffic law
- Regularly collaborate with the relevant authorities with the view to restricting the enforcement of traffic law.
- Create database program to control the data of worker-transporting drivers.

2.3 Review Previous Studies Related to Formulization or Regulation of Paratransit and Informal-Public Transit

Unregulated and unsupervised informal public transportation will produce unwanted outcome such as congestion, accident, environment, and noise pollution. Therefore, to eliminate or to integrate this transportation mode have gained its popularity by using many techniques and approaches such as franchising, territory definition, entry charges, vehicle and driver age restrictions, tenders, licensing and limit number of vehicle per operator, etc. These policies has been categorized by to be from acceptance to prohibition, representing different degrees of regulatory stringency from lax to strict (see Figure 2.9). However, formulization of postures usually face resistance by operators that sometime results in social turmoil. The argument thus is that regulation or formulization needs to be approached in a different manners, consistent with the need, peculiarities, and institutional capacity of a paratransit/informal public transit dependent city (Shittu, 2014).

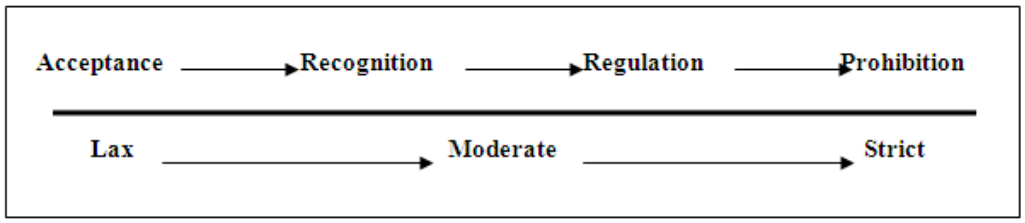

Figure 2.9 Spectrum of Policy responses to informal public transport (Cervero, 2000)

In Philippines, Diaz and Cal studied about the operational characteristic, sustainability under different operating scenarios, and recommendation of FX service (Toyota Tamaraw FX) between Manila and Quezon city, the Philippines (Diaz & Cal, 2005). The fare structure is assumed following investment recovery period, average number of passengers and distance. Finally, changing fare structure can have a significant impact on the sustainability of the operation. However, less than 5 passengers, the operators will be placed in a very serious financial situation, possibly resulting in going out of business.

Wilkinson constructed a research to explore an appropriate method of approaching the task of formulizing or regulating paratransit operations in Cape Town, Dar es Salaam and Nairobi, Africa. A series of questions were used including ‘a necessary precondition for effective competition?’, ‘whether to regulate (rationale)?’, ‘what to regulate?’, and ‘how to regulate?’ (Wilkinson, 2008). Then, he had joined with other researchers to explore the lesson learnt from three different approaches of regulations (Schalekamp & Behrens, 2009). As result, the successful of implementation depends on the scale of intervention being appropriate to the needs and capacities of the involved institutions, operations, and timeframe.

Bacero and Vergel aimed to categorize and evaluate the Jeepney vehicle based on ergonomics, safety, and environmental factors (Bacero & Vergel, 2009). They want to comply the existing Jeepney with mandatory, voluntary PNS standards, and international standard. Finally, this study will give baseline or recommended information that will help government agencies in standardization activities on CLRVs. Currently, PNS has five checklists for mandatory vehicles such as pneumatic tires,

rubber inner tubes, safety glass, seat belt, and restraint systems, while there are 32 checklists for international standards.

In Thailand, Tangphaisankun et al. had investigated the influence of commuter behaviors and attitudes towards travel alternatives (private care, paratransit, and public transit) in Bangkok (Tangphaisankun, Okamura, Nakamura, & Wang, 2010). The result of this research aim to achieve the policy for enhancing public transport performance and urban transportation through the idea of integrating paratransit as a feeders into urban transportation system. Fixed routes Songthaew offers cheap and safe service, but commuter are still dissatisfied with its unreliable waiting time and in-vehicle time. So, they proposed Songthaew-Express that offers headway control and limit stops, especially in peak hour.

Shittu (Shittu, 2014) has construct framework for managing paratransit operations in paratransit dependent cities of Nigeria by drawing lessons from literature as a way of identifying salient and pertinent issues in some developing countries. As conclusion, the systematic and holistic development of 'fit for the situation' framework is very important, the need to involve operators in the development of necessary management and operational instruments is also imperative. Moreover, the important key factor for transforming the informal transport sector to optimal benefits is the technology in terms of operation registration and licensing, traffic management, and transport service deployment.

Karl et al. had attempted to characterize manufacturing, assess the compliances and propose vehicle-related dimensions for the development of standards of Jeepney, Filcap and LUV in the Philippines (Karl et al., 2015). In this survey, 18 specifications have been recorded such as vehicle dimensions, materials, engine, electrical system, wheels and tires, safety device, warning device, chassis, ventilation system, braking system, lighting system, metal treatment process...etc. Finally, they have recommended vehicle-related dimensional standards that can be used as guides for developing countries in East Asia.

Another research about Jeepney and Songthaew, a group of researchers, (WONGWIRIYA, NAKAMURA, TANAKA, SANIT, & ARIYOSHI, 2015), had explored the roles and the regulation of Songthaew compare to Jeepney and other paratransit modes in Thailand. Some regulations of Songthaew are fixed or non-fixed routes, limit number of operators and vehicle, fare (cost-plus pricing), and licensing (7 year for fixed routes, and 5 years for non-fixed routed). Routes and fare of Songthaew are determine by the authority, while those of Jeepney are proposed by operator and finally are evaluated and approved by authority. Songthaew plays the role as feeder of mass transit system in Bangkok downtown but as the main public transit in other provinces, while Jeepney is a main public transport in regional capitals, especially metro manila.

Table 2.4 Summary of past researches related to formularization or regulation

Authors (year)	Country	Research on	Methods
Diaz & Cal (2005)	Philippines	Impact of government regulation on the sustainability of paratransit (Toyota FX) service between Manila and Quezon city.	Financial analysis
Wilkinson (2008) Schalemkamp et al. (2009)	Africa	Constructing research agenda to explore an appropriate formulization or regulation, and lesson learnt.	Literature review
Bacero and Vergel (2009)	Philippines	Assess the Jeepney's components, system and separate technical units for the development of standards.	Descriptive statistics
Tangphaisankun et al. (2010)	Thailand	Investigate the influences of commuter behaviors and attitudes towards travel alternatives (private care, paratransit and public transit) in Bangkok.	Questionnaire survey, SEM
Shittu (2014)	Nigeria	Constructing framework for managing paratransit operation.	Literature review
Karl et al. (2015)	Philippines	Evaluating the compliance of dimensions and selected system, and components of Jeepney.	National survey
Wongwiriya et al. (20015)	Thailand & Philippines	Compare the role and regulations of Songthaew of Thailand to Jeepney of the Philippines, and other paratransit modes in Thailand.	Literature review and interview

2.4 Review Previous Studies Related Traffic Law Enforcement, Commuting Satisfaction, and Willingness-To-Pay

To improve the actual performance of a transportation mean, it is necessary to understand the passengers' perception toward the service quality including safety, security, reliability, comfort, and service satisfaction (Munira, Samath, & Santoso, 2013; Phun, Pheng, & Yai, 2015). Especially, the passengers' willingness to pay is a very important direction for operators to improve their services effectively. However, formulization of informal public transportation mode is categorized by different level, from lax to strict, and usually face the operator resistance that sometime result in social turmoil (Shittu, 2014). Therefore, the characteristics and the perception toward traffic law enforcements of worker-transporting drivers are very important, unless it might not be applicable as the current situation.

2.4.1 Past Researches about Traffic Law Enforcement

A central concern of informal public transportation is responsible for the significant negative externalities, like traffic congestion and accidents that harm the public safety and welfare (Cervero, 2000). Therefore, formularization to regulate and to integrate into formal public transportation system is very challenging and have been generating debate on how to effectively administer this commuting mode. Varying techniques and approaches employed in integrating such as franchising, territory definition, entry charges, vehicle and driver age restrictions, tenders, licensing and limitation of number of vehicles per operators...etc. These policies has been categorized by to be from acceptance to prohibition, representing different degrees of regulatory stringency from lax to strict. However, the argument in regulation or formulation will occur, and need to be approached in different manner (Shittu, 2014). Therefore, understanding the characteristics and the attitude toward regulation or traffic law enforcement of the operators or drivers would enhance the policy makers to effectively set up appropriate enforcements to specific group of people, area or activities.

Traffic Law Enforcement has been defined as the area of activity aimed at controlling road user behavior by preventative, persuasive, and punitive measures in ordered to effect the safe and efficient movement of traffic (Zaal, 1994). The important of traffic law enforcement has been clearly demonstrated by estimates derived in Norway, indicating that the elimination of traffic law violations could result in a 20% to 25% reduction in number of traffic injury accidents. Evan (1991) has suggested that the accident reduction potential of traffic law enforcement may even be much higher at a level closer to 40%. However, the traffic law enforcement can be extremely costly activity and many policing authorities have developed methods to increase the efficiency and effectiveness of the enforcement operation. The success of enforcement is dependent on its ability to create a meaningful deterrent threat to road users. To achieve this this, the primary focus should be on increasing surveillance levels to ensure that perceived apprehension risk is high.

In United States, Kweon and Kockelman had study about the driver's attitudes and choices towards speed limits, seat belt use, and drinking-and-driving based the data from the Motor Vehicle Occupants Safety Survey (Kweon & Kockelman, 2006). 4,057 to 4,137 respondents, ageing 16 and older and collecting from 50 state of USA, are finalized for analysis using ordered probit model, negative binomial model, and standard ordinary least square regression. The questionnaire are divided into two parts, personal information and traffic safety issues. There is a multitude of results from this work. For example, male are less likely to use seat belt and favor seat belt laws, but more likely to favor raised speed limits, to drive faster on highways, and to drive after drinking. In general, males are found to exhibit riskier behaviors and less favorable attitudes towards safety policies than females.

Another research in USA, Kim & Yamashita ascertained attitudes and self-reported behaviors regarding seat belt use of commercial motor vehicle drivers in Hawaii (Kim & Yamashita, 2007). A total of 791 drivers responded to a written questionnaire implemented at weigh stations and distributed to various trucking firms and transport centers. Probit Model was used to explain the probability of self-reported seat belt

use under the aid of a statistical software package, SAS. The logit model suggest a multi-tiered approach to increase seat belt use. In addition to educating more drivers about the law and perhaps using enforcement or the threat of enforcement. Education programs, company reminders, and publicly disseminated information that CMV drivers are changing their behavior may serve to create as incentive for some non-users to begin using their seat belts.

In Thailand, Rudjanakanoknad et al. had conducted a research to investigate the driver's attitudes concerning the implementation of stricter speed enforcement program on expressways in Bangkok (Rudjanakanoknad, Prarom, & Panwai, 2012). Self-reported questionnaire is the mean to collect data, while 1,169 respondents are used for analysis. The questionnaire compose of three main parts, socioeconomics, driving characteristics, and the agreement on stricter speed enforcement policy. Regression analysis, Ordered Probit Analysis and Ordinary Least Square, are used to analyze the significant factors affecting drivers' characteristics and attitude. As result, they found that car drivers who prefer stricter enforcement are female, older, have higher education, live in Bangkok, have less driving experience, drive less on frequent on expressway, and rarely get speeding tickets.

In Australia, Watling & Leal had examined the relationships between self-reported likelihood of behavior, perceived legitimacy of traffic law enforcement, and attitudes toward drink-driving, fatigues driving, speeding, and driving without seatbelt (Watling & Leal, 2012). The respondents are required to currently driver on Queensland roads, Australia, and have held an open driver's license. The survey was done by the mean of Queensland University of Technology email, social networking sites, and a research participation link on website of the Centre for Accident Research and Road Safety. Finally, 312 responses were received before the survey link was closed, but there are only 293 data are valid for analyzing.

In Cambodia, a group of researchers, namely K. Brijs, T. Brijs, S. Sann, T.A. Trinh, G. Wets, and R.A.C. Ruiter, has adopted a socio-cognitive perspective towards the examination

of helmet use in a sample of Cambodian young adults during spring 2009 (Brijs et al., 2014b). Two theoretical models, i.e., Health Belief Model and Theory of Planned Behavior were combined and further complemented with two norm-related variables, i.e., descriptive- and personal- norm. In this survey, the questionnaire had divided into sex steps, [1] to identify the good measurement items for various HBM- and TPB-concepts, [2] in-depth interviews with key stakeholders such as NRSC, CRC, JICA, CRS, ME, MoEYS, OMTP, [3] discuss results with those stakeholders, [4] discuss questionnaire with native Cambodian researchers, [5] pre-tested the interview questionnaire with a small scale of 10 person, [6] final survey. Questionnaire compose of two sections including personal data and 46 items measuring the set of 14 socio-cognitive constructs, and 344 motorcyclists are collected for analysis. As result, helmet use behavior was found to be determined by the following five key-determinants: perceived behavioral control over a specific set of inhibiting situational factor, perceived behavioral control in general, perceived susceptibility, personal norm, and behavioral intentions.

2.4.2 Past Researches about Overall Travel Satisfaction

Commuter satisfaction originated from customer satisfaction research, which has been a popular topic in marking practice and academic research since Cardozo's (1965) initial study of customer efforts, expectations and satisfaction. The definition of Customer Satisfaction are defined by several researchers as following: [1] Olivier: the evaluative process that contrasts prepurchase expectations with the perceptions of performance during and after the consumption experience, [2] Gundersen et al.: the post consumption evaluative judgment of a specific product or service (Huiqun & Xin, 2009), [3] Friman & Felloson: the results from the service offered and customer's reaction to the service, varied depending on a person's attitudes, personality, and predispositions (St-Louis, Manaugh, van Lierop, & El-Geneidy, 2014). There are many variety of difference oriented measurement approaches dealing the customers satisfaction like Expectancy Disconfirmation Model, Fornell's Satisfaction Model, Consumer Behavioral Analysis...etc., depending on objectives, frameworks, and analysis techniques

(Grigoroudis & Siskos, 2004). Through literature review, three approaches are extensively used and developed to measure satisfaction level in transportation sectors such as Disconfirmative Model or Gaped Based Model, Satisfaction with Travel Scale, and Kano Model. Passenger Satisfaction are widely used around Globe with two important reasons such as to compared satisfaction across modes, and to evaluated the passengers satisfaction on service quality (especially public transit).

Through the definition, Disconfirmative Model or Gaped Based Model (Olivier, 1980; McQuitty, Finn, and Wiley, 2000) are widely used to predict the effects of personal characteristics and service quality on passengers' perceived performance. The theory was developed by Oliver, who propose that the satisfaction level is a result of the difference between expected and perceived performance. Satisfaction (positive disconfirmation) occurs when the product or service is better than expected. On other hand, a performance worse than expected results is dissatisfaction (negative disconfirmation), (Huiqun & Xin, 2009). In this case, there are several kind of frameworks used to predict the effect of service attribute on customers' perceived performance depending on service attributes, sampling, and analysis methods.

In India, Randheer et al. have examined the commuters' perception on service quality offered by the public transport services in Hyderabad and Secunderabad (Randheer, Al-Motawa, & Vijay, 2011). The SERVQUAL scale is administered to measure the commuters' perception on service quality. To understand the conceptualization and operationalization of service quality, 28 items was generated related to tangibility, reliability, responsiveness, assurance, empathy, and cultural. 5-likert scale are used to rate these attributes. Finally, tangible factor was eliminated by using factor analysis.

In Spain, Del Castillo and G. Benitez had done a research about the users' satisfaction on public bus service in Bilbao (Del Castillo & Benitez, 2012). 0-10 scale were used to rate the overall and 35 service attributes grouping into 8 categories connectivity, accessibility, information, time satisfaction, user attendance, comfort, safety/security, and environmental impact. Three methods, model based on means, model based on

multivariate and generalized linear model are used to predict the overall satisfaction index with the advantage of identifying the robustness of the service aspects.

In South Africa, a research team, M. Ashraf Javid, T. Okamura, F. Nakamura, and R. Wang, have conducted a study to evaluate passengers' preferences and satisfaction from different mode users (walking/bicyclist, motorcyclist, private car, and public transport) toward service quality of wagon or minibus in Lahore (Javid, Okamura, Nakamura, & Wang, 2013). A questionnaire was designed consisting of two parts, personal and trip information, and level of satisfaction with service quality of wagon service, then 631 samples obtained. 4-likert scale are employed to evaluate the service attributes grouping into three perspectives namely symbolic, functional, and cost & time. Finally, they found that public transport users are highly, motorcycle and non-motorized users are moderate, and car users less satisfied with most of service quality attributes of wagon service.

Moreover, an assessment of commuters' perception on safety and comfort levels of Women Only Coach of a heavy rail was done in Malaysia (Bachok, Osman, Murad, & Ibrahim, 2014). An on-board survey was conducted among the commuters of WOC, and 513 final data are used for analysis. The questionnaires consisted of four main sections: socio-demographic characteristics, trip characteristics, use of WOC, perception of safety and comfort on WOC and suggestion for improvement of WOC. With descriptive statistics and hypothesis testing, they found that most of respondents felt insecure due lack of security officers, and presence of male riders; comfort level depend on capacity; and perceived safety depend on enforcement. However, they believed that WOC is more reliable, comfortable, and safety compare to the regular coaches.

In Nigeria, M.O. Olawole and O. Aloba had explored elderly mobility characteristics, commuter patterns, quality of transport services and problems associated with the use of public transport services in Osogbo (Olawole & Aloba, 2014). 250 respondents aging 60 years old or more were collected from three residential zone, low, medium, and

high density. 1-5 likert scale were used to rate the elderly's perception of satisfaction with the available transport services and the transport constraint.

St-Louis et al. used a large-scale travel survey to compare commuter satisfaction across six modes of transportation (walking, bicycle, automobile, bus, metro, and commuter train). The data used in this survey was obtained from all staffs and one third of all students at McGill University in Montreal, Canada (St-Louis et al., 2014). Using ordinary least square regression, they predict trip satisfaction in term of trip and travel characteristics, personal characteristics, and travel and mode preferences.

Phun et al. (2015) used ordered probit regression to assess passengers' perceived performance of public bus in Phnom Penh, Cambodia (Phun et al., 2015). From 1100 data of on-board survey, the result showed that the perceived public bus performance is likely to improve by enhancing the bus attributes (speed, comfort...etc.), and by addressing passengers concerns (request for bus service expansion).

In Netherland, Mouwen use multiple regression to study the interaction between overall satisfaction of public transport and a number of customer characteristics with 180,000 respondents (Mouwen, 2015). Using 1-10 scale, there are two groups of attributes covering 15 PT service, such as core attributes (what is delivered), and peripheral attributes (how the service is delivered). Moreover, He have also studied the interaction between satisfaction and negative social safety experiences (NSSEs). As result, the attributes on-time performance, travel speed, and service frequency are seen by PY users as the most important, followed by personal/drivers behavior, and vehicle tidiness.

In China, a group of researchers have explored metro commuters' satisfaction with the entire journey, considering potential differences in perceptions among difference access and egress transfer group (Yang, Zhao, Wang, Liu, & Li, 2015). Moreover, many relevant factors are considered, including personal attributes, journey details about transfer costs, time and commuters' perceptions of access and egress travel services

(walk, bike, car, and bus). Binary logistic regression are used to generate the satisfaction model with the total data of 825 metro users in Nanjing.

Satisfaction with Travel Scale (STS) has been discussed and used extensively in transportation sector. This concept was conceived based on the idea of subjective well-being, which suggests that both cognitive judgment (self-reported rating), as well as effective judgment of satisfaction (duration and intensity of positive and negative affects during a given time span), should be examined when assessing overall satisfaction (St-Louis et al., 2014). This method is a method aimed to directly measured travel satisfaction than the satisfaction derived from observed choices (Ettema, Friman, Gärling, Olsson, & Fujii, 2012). Likert-scale are used to rate the nine items of STS (see Figure 2.10), while the first three items relate to the cognitive/quality dimension, and other six items relate to effective dimension, the combination of the valence and activation dimensions (Olsson, Friman, Pareigis, & Edvardsson, 2012).

Positive deactivation–negative activation (STS_PD)
Very hurried (−3) – Very relaxed (3)
Very worried (−3) – Very confident (3)
Very stressed (−3) – Very calm (3)

Positive activation–negative deactivation (STS_PA)
Very tired (−3) – Very alert (3)
Very bored (−3) – Very enthusiastic (3)
Very fed up(−3) – Very engaged (3)

Cognitive evaluation (STS_CE)
Worst I can think of (−3) – Best I can think of (3)
Very low standard (−3) – Very high standard (3)
Worked very poorly (−3) – Worked very well (3)

Figure 2.10 The satisfaction with travel scale (STS) (Ettema et al., 2012)

In Sweden, Ettema et al. investigated how activities during work commuters (to and from work) by public transport (bus, train, and tram) impact on satisfaction with travel as measured by the three components (see Figure 2.10) assessed by the satisfaction with travel scale (STS): the affect measures positive activation, positive deactivation, and the cognitive evaluation (Ettema et al., 2012). Likert scale (-3 to 3) were employed

to rate the three components of STS by 520 respondents from Stockholm, Göteborg, and Malmö. STS index score were constructed for the three STS dimensions by averaging across the items measuring each. Then regression are used to generate the models of STS index in function of socio-demographic, travel mode, and activities during travel.

Similarly, Olsson et al. used STS to measure the customers' service experience of public transport in Karlstad and Gothenburg, Sweden (Olsson et al., 2012). Likert-scale (-4 to 4) are used to rate the nine element of STS, and a 361 data are collected for analysis. Principal component analysis and confirmatory factor analysis are used to test and confirm the dimensionality of service experience in public transport.

Another research in Sweden, Sakmayasa aimed to analyze the relationship between overall satisfaction and service quality attribute of public bus in Karlstad before and after the improvement by using STS concept (Sukmayasa, 2014). 1-7 likert scale is used to assess perceived performance of service attributes (both from literature review and improvement service attributes), while -3 to 3 likert scales is used to rate the items of STS. Factor analysis and multiple regression are used to generate the three models of STS such as positive activation, positive deactivation, and cognitive evaluation. In pre-study, comfort attribute strongly affect passengers' satisfaction, while in post study it is affected by accessibility and mobility. In conclusion, the improvement of new bus has enhanced customer satisfaction due to the consumer's fulfillment response.

Another method is Kano Model which classify the attributes of service of product in term of their impact on customer satisfaction (Kano, 1984). It is based on the notion of that not all customer needs are created equal and therefore the resolution of all needs does not have the same impact on customer satisfaction (Mokonyama & Venter, 2013). Kano's model is also known as the theory of attractive quality and presents five quality attributes or dimensions such as attractive, one-dimensional, indifferent, must-be and reverse quality attributes. This theory of attractive quality posits that quality attributes are dynamic and can change over time (Lai & Wu, 2011).

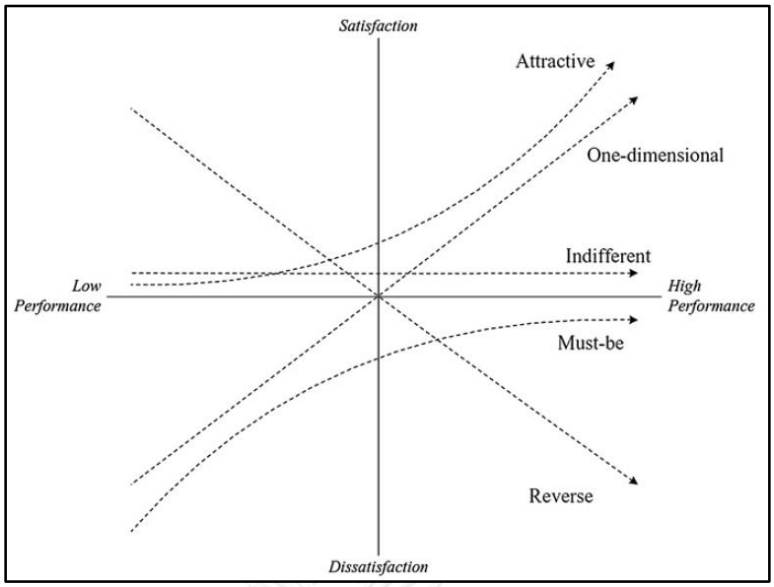

Figure 2.11 The Kano model of customer satisfaction (Mokonyama & Venter, 2013)

In Taiwan, Lai and Wu use Kano's model and ANOVA techniques to evaluate the service quality of KTRS trains (Lai & Wu, 2011). 1-5 likert scale is used to rate the satisfaction level with 27 service items grouping into 5 dimensions including tangibles, reliability, responsiveness, assurance, and empathy. A total of 473 train users are valid for analysis. Then factor analysis are used to eliminate under reliability and validity condition. Finally, 20 items are valid for Kano classification, while half of these service attributes are considered as Must-be attributes, 9 items were considered as One-dimensional attributes, and another one items are considered as attractive attribute.

In South Africa, Mokonyama and Venter carried out the relationship between customer satisfaction and public transport (train) contracts (Mokonyama & Venter, 2013). The total sample comprised 64 respondents travelling between Tshwane and Johannesburg, with the split as: 21 TBE users and 12 non-users for design 1, and 19 TBE users and 12 non-users for design 2. 0-10 scale is used to rate the attribute levels of 10 service attributes, and finally the respondents were asked whether they will choose public of private car, and their main reason. Multiple regression are used to generate the model of overall customer satisfaction in term of service attributes levels. For PT users, reliability, security, staff respect, and having hostess are must-be attribute.

For non-users, newspapers, payment method, and having a hostess are attractive attributes, while security is a must-be attributes. Moreover, non-users consider service frequency as the performance attribute.

2.4.3 Past Researches about Willingness-To-Pay

Another important keyword from passenger viewpoint, is the willingness-to-pay (WTP) to get a better commuting condition. Customer's willingness-to-pay is the maximum amount of money that a person is willing to pay for a good or service is a direct indication of what that good or service is worth to the person, relative to his or her other potential objects or expenditure. Furthermore, willingness-to-pay is the indication of strength of preference, taking due account of resource constraints (Jones-Lee & Loomes, 1994). Willingness-to-pay is used to measure the behavior of a person in respond to possible increase in his transportation expense, in exchange for a better commuting services such as time saving, time reliability, reducing risk, reducing crowding or better transportation mode. Through literature review, a huge variety of competing approaches and corresponding analytic techniques for measuring WTP depending on surveying techniques, and characteristic of data (see Figure 2.12). So, there are two method using to estimate the WTP namely revealed preference, and state preference. However, stated preference is the most common method, generally called contingent valuation.

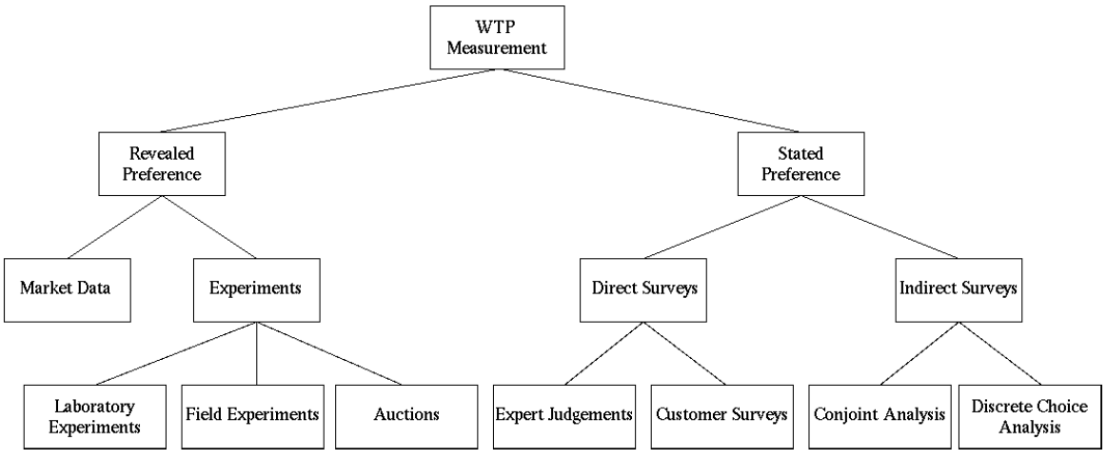

Figure 2.12 Classification framework for methods to measure willingness-to-pay (Breidert, Hahsler, & Reutterer, 2006)

In Italy, Eboli and Mazzulla have examined the willingness-to-pay for improving the quality levels of a bus service, from the student of University of Calabria (Eboli & Mazzulla, 2008). 470 respondents are asked for their WTP on 3 options with 9 service attributes including walking distance, frequency, reliability, bus stop facilities, crowded, cleanliness, fare, information, and personnel attitude. Some logit models (multinomial logit, mixed logit, and random logit) are used to calculate the passengers' WTP. Finally, all the service attributes are significant, while frequency has the maximum value and information has the minimum value. WTO for improvement in service frequency is 2 time higher than service reliability, 3 time higher than cleanliness, and 5 time higher than others.

In Phnom Penh, Long (Borith, 2010) asked the passengers' willingness-to-pay for commuting fare of future urban rail. In his study, he tried assess the influence of WTP on the behavioral intention towards future sky train usage, but it was not significant. Similarly, a group of researchers (Mark, Anneli, Ishtar, & Cecilia, 2014) tried to measure passengers' WTP for a future safer and more efficient transportation mode, urban rail MRT-7 in Philippines. In this study, the respondents were asked for additional fare for time reduction (0, 15, 30, 45 min) to their current commuting fare.

In Japan, Takada and Fujiu analyzed the willingness-to-pay for reducing the lost time of railway users in Tokyo (Takada & Fujiu, 2009). Contingent valuation method (CVM) was applied to inquire their WTP in the survey, while 392 data are collected. Respondent' WTP is asked at difference reduction ratio (50%, 100%) and lost time per year (2, 6, 12 hours per year). Then, survival analysis and proportional hazard model are used to construct the expectation of WTP.

Table 2.5 Summary of past researches about overall travel satisfaction, willingness-to-pay, and traffic law enforcement

Authors (year)	Country	Research on	Methods (data collection, sample)
Traffic Law Enforcement Model Review			
Kweon & Kockelman (2006)	USA	Driver's attitude and choices towards speed limits, seat belt use, and drinking-and-driving In 50 states of USA	Order probit and negative binomial model, and linear regression (MVOSS, 4137)
Kim & Yamashita (2007)		Attitudes and self-reported behaviors regarding seat belt use of commercial motor vehicle drivers in Hawaii	Multivariate Logit Model (Fieldwork survey, 791)
Rudjanakanoknad et al. (2011)	Thailand	Investigate the drivers' attitudes towards the implementation of stricter speed enforcement program on expressways	Ordered Probit regression and OLS (Fieldwork survey, 1169)
Walting et al. (2012)	Australia	Examine the relationship between self-reported likelihood of behavior, perceived legitimacy, and attitude towards traffic law enforcement	Descriptive statistics (Online survey, 312)
Brijs et al. (2014)	Cambodia	Investigate the socio-cognitive perspective towards the examination of helmet use among Cambodia young adults	Combination of Health Belief Model and Theory of Planned Behavior (Fieldwork survey, 344)
Confirmation-Disconfirmation Model or Gap Based Model Review			
Ranheer et al. (2011)	India	Commuters' perception on service quality in by public transport services in Hyderabad and Secunderabad	Correlation and regression analysis (Fieldwork survey, 512)
Castillo & Benitez (2012)	Spain	Users satisfaction on Public Bus company in Bilbao	Models based on Mean, Multivariate and Linear Model (Fieldwork survey, 1508)
Javid et al. (2013)	South Africa	Commuters' satisfaction from different mode users with service quality of wagon or minibus in Lahore	Multivariate analysis (Fieldwork survey, 631)

Authors (year)	Country	Research on	Methods (data collection, sample)
Bachok et al. (2014)	Malaysia	Commuters' perception on safety and comfort levels of Women Only Coach (train) of KTM Komuter	Descriptive statistics and hypothesis testing (Fieldwork survey, 513)
Olawole & Aloba (2014)	Nigeria	Elderly's mobility characteristics and perception of satisfaction with transport services and constraint in Oshogbo	Descriptive statistics (Home survey, 250)
St-Lois et al. (2014)	Canada	Commuter satisfaction across six transportation modes of staffs and students at McGill University in Montreal	ANOVA tests, OLS Regression (Online survey,3377)
Phun et al. (2015)	Cambodia	Perceived performance of public bus in Phnom Penh	Ordered Probit Analysis (Fieldwork survey, 1100)
Mouwen (2015)	Netherlands	Customer satisfaction with public transport services	Linear regression analysis (fieldwork survey, 180000)
Yang et al. (2015)	China	Metro Commuters' satisfaction in multi-type access and egress transferring groups in Nanjing	Binary logit model (fieldwork survey, 825)
Satisfaction with Travel Scale (STS) Model Review			
Ettema et al. (2012)	Sweden	Commuter satisfaction with public transports service to/from work in Stockholm, Göteborg, and Malmö	STS, OLS Regression (Home mailbox, 520)
Olsson et al. (2012)		Commuter satisfaction with public transport service in Karlstad and Gothenburg	STS, Principal component analysis and factor analysis (Home mailbox, 361)
Sakmayasa (2014)		Compare commuter satisfaction with public bus services before and after service improvement in Karlstad	STS, factor analysis, and multiple regression (Fieldwork survey, 240)

Authors (year)	Country	Research on	Methods (data collection, sample)
Kano Model Review			
Lai & Wu (2011)	Taiwan	Commuter satisfaction with service quality of Public train	Kano's model and ANOVA techniques (Fieldwork survey, 473)
Mokonyama & Venter (2013)	South Africa	Commuter satisfaction and mode choice between public transit users and private car user	Kano's model and multiple regression (Fieldwork survey, 64)
Willingness-to-Pay Review			
Eboli & Mazzulla (2008)	Italy	WTP for improvement in service quality of public bus of student in University of Calabria	Contingent value method and Multinomial Logit & Mixed Logit (Fieldwork survey, 470)
Long & Choocharukul (2010)	Cambodia	The Influence of WTP on behavioral intention towards future urban rail usage	Structural Equation Modelling (Fieldwork survey, 398)
Takada & Fujiu (2010)	Japan	WTP for reducing lost time of railway users in Tokyo	Contingent value method and survival analysis model (Fieldwork survey, 392)
Mark et al. (2014)	Philippines	Passengers' WTP for future urban rail, MRT-7	Descriptive Statistics (Fieldwork survey, 100)

2.5 Summary

In summary, Cambodia economic grow steadily with the average annual growth rate about 7% since 2012. In this content, garment and footwear industries is the major factor which pushes Cambodian economic to this growth level. These two sectors account for 80% of Cambodian's total export and foreign trend, and employ for more than 600,000 workers. These workers commute to workplace by various type of transportation modes including, walking, bike cycle, motor cycle, tricycle, long-tailed remork, van and flatbed truck. For workers who commute to workplace by vehicles, i.e., long-tailed remork, van, and flatbed truck, are about 10 percent if the factories are

situated in the urban area of Phnom Penh, and about 70 percent if the factories is situated in the Suburb area of Phnom Penh or in the provincial area. However, the transportation condition of these workers is still bad in term of comfort, and safety. These problems are because of many reasons such as: poor road condition, drunk driver, young driver, illegally design vehicle, lack maintenance, overload, lack personal security for passenger, and poor law enforcement.

For past researches about formulization or regulation of informal public transport or paratransit, we found that there are many techniques and approaches are implemented and they have their own pros and cons. Successful regulations need to fit with the existing condition, have adequate timeframe, and secure the sustainability of public mobility. Generally, safety is the main concern of informal public transit due to poor vehicle condition, inadequate maintenance, aggressive drivers, and overloaded vehicle. In case of Jeepney, there are many researches are conducted to develop the guideline or recommendation for vehicle specifications including dimension, brake systems, seats, tires, steering system, chassis...etc. In addition, there are also some other regulations for Jeepney or Songthaew such as routes, number of vehicles per route, and fare, but the process of determining is different.

From the past researches, we can see that there are a lot of methods and sources of data, were used to analysis the factors affecting commuting satisfaction, willingness-to-pay and traffic law enforcement. These papers investigated on the public transport (Train, Bus, and School Bus), Private vehicle, motorcycle, and active modes (walking and bicycle). However, there are no specific study about worker-transporting vehicles in Phnom Penh, which are quite different from those literatures such as the vehicle characteristics, trip characteristics, regulations and workers/drivers' attitudes toward safety. Thus, this study play an important role to investigate the perception of garment and footwear workers in Cambodia on their daily commuting mode and their willingness to pay to improve safety and comfort. In addition, we also investigate the perception of drivers on stricter enforcement of traffic law.

Chapter 3
METHODOLOGY

3.1 Research Framework

Since there are two objectives in this thesis (see Chapter 1), we need questionnaire survey, in-depth interview, and statistical regression to fulfill the first object, while to propose some policies will required lesson learnt from literature review, findings from first objective, and accident cause analysis. In this case, in-depth interview refers to interview with representative from factories and labor union, and questionnaire survey refers to interview with worker-transporting drivers, passengers (garment and footwear workers), and general drivers.

Through literature review, there are many types of methodology and sources of data were used. For first objective, we have to modify the methodology and questionnaires to get a reliable data reflecting to the real condition of commuting of garment and footwear in Cambodia. From questionnaire survey, we will construct the regression models from both sides, i.e. garment and footwear workers as passenger and worker-transporting driver. For worker-transporting drivers, total fare revenue and their perception towards traffic law enforcement will be generate against their socioeconomics and driving characteristics (see Figure 3.1). Similarly, we will generate the model of safety concern, overall commuting satisfaction, and willingness-to-pay in function of workers' socioeconomics, and commuting characteristics (see Figure 3.2). Finally, the policy recommendations will be proposed under the supports from lesson learnt from literature review, in-depth interview, questionnaire survey, regression models, and accident cause analysis (see Figure 3.3).

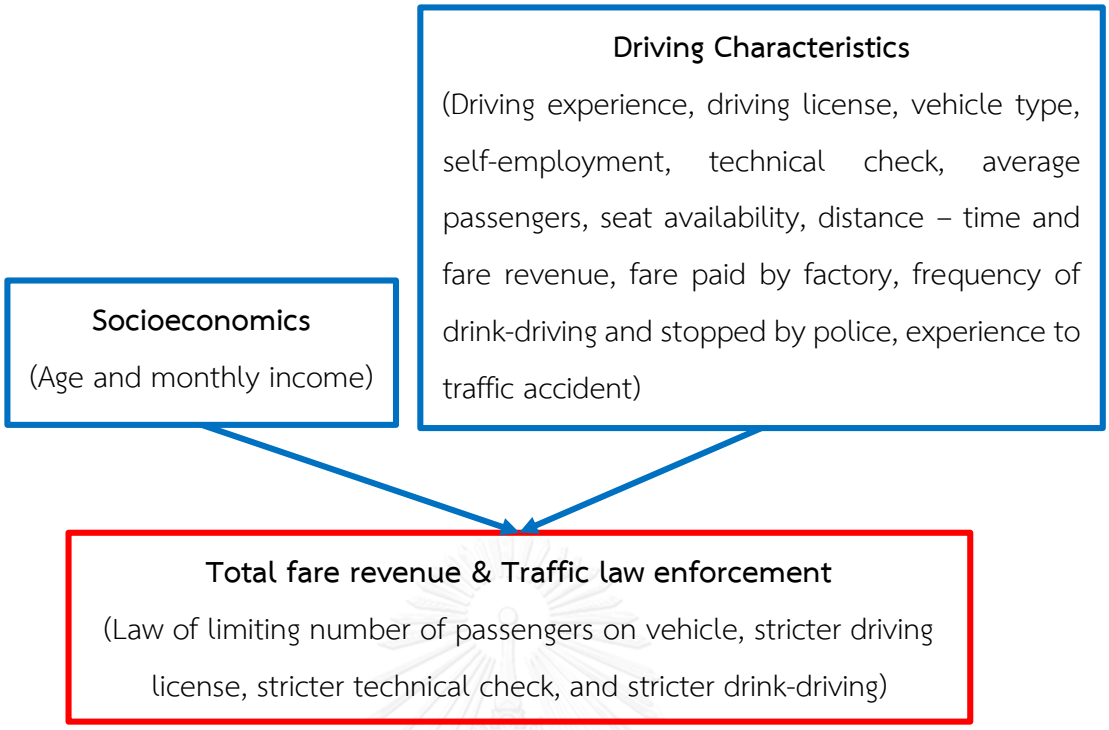

Figure 3.1 Framework of regression models for worker-transporting drivers

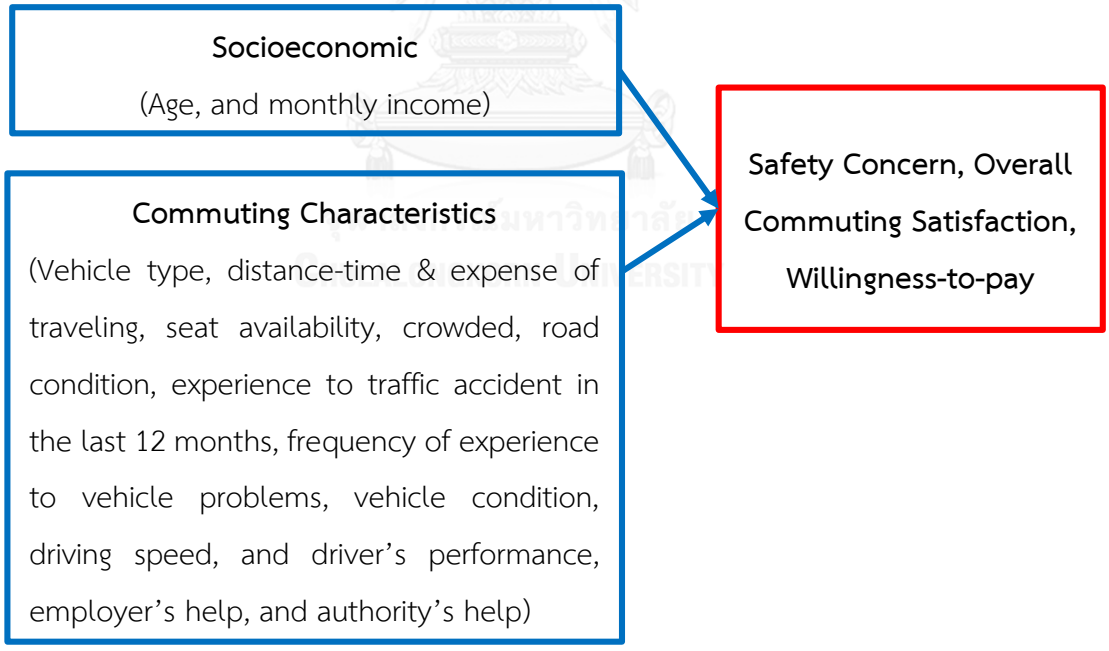

Figure 3.2 Framework of regression models for garment and footwear workers

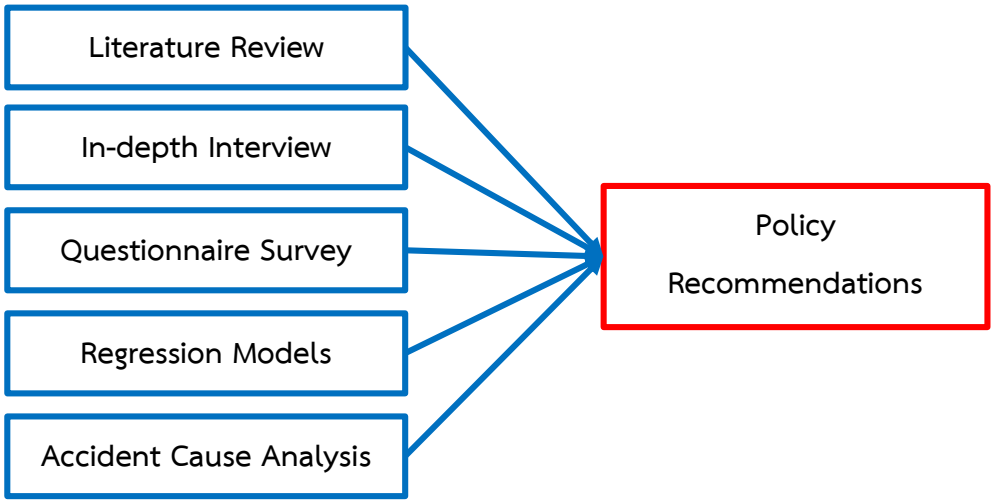

Figure 3.3 Framework of policy recommendations

3.2 Data

3.2.1 Interview Data

Interview data will cover both questionnaire survey and in-depth interview. Three groups of respondents in questionnaire survey are passengers (i.e. garment and footwear workers), worker-transporting drivers, and general drivers. Generally, garment and footwear workers who commute to workplace by public vehicle work around 8 to 10 hours per day, from 7:00 am to 11:00 am plus 12:00pm to 4:00pm, and overtime from 4:00pm to 6:00pm. But on Saturday and Sunday, they mostly finish work at 4:00pm. So, we decide to interview with workers at their home on Sunday and public holidays. Worker-transporting drivers are interviewed on week days at parking place and in front of factories while they are waiting for passengers, from 3:30pm to 6:00pm. For general drivers, we will interview them at gas-stations nearby the factories, along the road that has worker-transporting vehicles pass by. On the other hand, in-depth interview are done with the representatives of factories and labor union at their office. The interview locations are mostly done at the suburb area since the percentage of workers commuting by public vehicles is very high, i.e. in Phnom Penh, Kandal province, and Kompong Speu province, where more than 95 percent of factories situate in these provinces.

3.2.2 Data Requirement for Regression Models

Sample size is a crucial concern to provide a reliable model. There are three criteria will be specified to determine the appropriate sample size: level of precision or sampling error, confident level or risk level, and degree of variability. Moreover, There are several approaches to determine the sample size including, using a census for small population, imitating a sample size of similar studies, using published tables, and applying formula to calculate a sample size (Israel, 1992). Based on the Published table, the require sample size should be around 400 sample at the precision level of ±5% and the population size greater than 100,000. Another approach are known as N:q Rule where N is the sample size and q is the number of parameters, and this rule applicable when the estimation method used is Maximum Likelihood. In this method provide two value of this ratio, the minimum sample size N:q=10 and the ideal sample size N:q=20 (Kline, 2011). From the questionnaire sheet, we expect there are around 21 parameters, so the minimum sample size is 210 and the ideal sample size is 420. In other hand, Barrett (2007) suggested that reviewers of journal submissions routinely reject for publication any SEM analysis where N<200 unless the population studies is restricted on size.

However, due to some difficulties in collecting data, we expect to interview with 150 garment and footwear workers, 100 worker-transporting drivers, 50 general drivers, and several representatives from factories and labor union.

3.2.3 Accident Data

For traffic accident data, we record it from online local and international news including place, date, causes, number of victims ...etc. We record the accidents happened from January 2016 to February 2017. The causes of these accidents are group into two kinds: external factor (caused by other drivers) and internal factor. The internal causes are categorized into three factors related to worker-transporting driver, worker-transporting vehicle, and infrastructure. In this case, one accident can be related to several factors. For example, as accident are recorded as the drivers

overtake another vehicle leading to overturn, so the related causes are the combination of driver and vehicle because the driver speed up and overtake, and crowded standing passengers move to other side leading to overturn (jerking). Another example that was recorded that the drivers try to overtake by driving on the opposite lane, and facing another opposite direction vehicle, then the drivers try to go back to their lane, and end up in rear accident. In this case, we supposed that the cause of accident is related to drivers, infrastructure, and vehicle. This because the drivers try to overtake in the risky condition, on a good road surface but narrow width, and overload vehicle with inappropriate brake capacity.

3.3 Detail Questionnaires for Worker-transporting Drivers

As shown in the design framework, the objective models are, [1] Total fare revenue, [2] Law of limiting number of passengers on vehicle, [3] stricter driving license, [4] stricter technical check, and [5] stricter drink-driving. There are 30 questions was designed to get the important information (see Table 1.1). Firstly, there are about 2 questions about the socioeconomic, namely age, and monthly income. Second part is about the driving characteristics, composed of 14 questions about driving experience, driving license, vehicle type, self-employment, payment from factory, vehicle's technical check, average passengers, seat, distance-time & fare of traveling, frequency of drink-driving and stopped by police, and experience to traffic accident in the last 12 months. The third part focuses on the opinions of drivers with total of 14 questions including current commuting is a serious problem and better than few year ago; appropriate support from employer and authority; effectiveness of public bus, using bus-van, road improvement and layby at the factory; agreement on the law of limiting number of passengers on vehicle, stricter driving license, stricter vehicle's technical check, stricter drink-driving; and acceptable fare revenue. However, we also ask some drivers several more questions such as appropriate number of passengers on vehicle, whether they drive in the morning faster than do in the evening, acceptable revenues for improving commuting condition, and their suggestions.

Table 3.1 Detail questionnaire sheet for drivers

Questionnaires	Attribute level
Q1: How old are you?	Year
Q2: What is your monthly income?	$/month
Q3: How long have you worked as driver?	Year
Q4: What type of driving license do you have?	A1, A2, B, C, D1, D2, E
Q5: What is your vehicle type?	Long-tailed remork, Van, Bus, Flatbed truck (1T-1.5T, 2T-2.5T)
Q6: You work for yourself?	Yes/No
Q7: You get the payment from factory?	Yes/No
Q8: Do you have vehicle's technical check?	Yes/No
Q9: What is the average passengers in your vehicle?	Person
Q10: Do you provide seat to your passengers?	Yes/No
Q11: How far do you drive for one way trip?	Kilometer
Q12: How many minutes do you spend per trip?	Minute
Q13: How much do you charge from passengers?	$/month
Q14: How often do you drink and drive?	(0-4)Never – Everyday
Q15: How often do you stopped by police? (license, drink-driving, vehicle registration, vehicle checking)	(0-4)Never – Everyday
Q16: Have you experienced to traffic accident in the last 12 months?	Yes/No
Q17: What do you think about the commuting condition of workers in your vehicle (safety, comfort)?	0: No problem, 1: Problem, 2: Serious problem
Q18: What do you think about the commuting condition of workers of others vehicles or factories?	0: No problem, 1: Problem, 2: Serious problem
Q19: What do you think about the commuting condition between now and the past few years ago?	0: Same, 1: Better, 2: A lot better
Q20: What do you think about employer in help solving this commuting problem?	0: Nothing, 1: Little, 2: A lot
Q21: What do you think about authority in help solving this commuting problem?	0: Nothing, 1: Little, 2: A lot
Q22: Public bus can help solving this problem.	0: Nothing, 1: Little, 2: A lot
Q23: Using bus or van can help solving this problem.	0: Nothing, 1: Little, 2: A lot

Questionnaires	Attribute level
Q24: Road improvement can help solving this problem.	0: Nothing, 1: Little, 2: A lot
Q25: The layby at the factory can help solving this problem.	0: Nothing, 1: Little, 2: A lot
Q26: The law of limiting number of passengers on vehicle.	0: Disagree, 1: Neutral, 2: Agree
Q27: Stricter enforcement of driving license.	0: Disagree, 1: Neutral, 2: Agree
Q28: Stricter enforcement of vehicle check.	0: Disagree, 1: Neutral, 2: Agree
Q29: Stricter enforcement of drink-driving.	0: Disagree, 1: Neutral, 2: Agree
Q30: What is your minimum fare revenue, if you were enforced to provide seat, and stricter enforcement?	$/month

3.4 Detail Questionnaires for Garment and Footwear Workers

Similarly, we try to investigate the socioeconomic factors and the commuting characteristics that would affect workers' concern about safety, overall commuting satisfaction and willingness to pay for improving commuting condition. There are 31 questions in the questionnaire sheet for workers, which divided into three parts, such as socioeconomics, commuting characteristics, and opinions. In the part of socioeconomic, there are 2 questions including age, and monthly income. The second part is about the commuting characteristics which compose of 15 questions, asking about vehicle types, commuting fare- distance and time, seat, average number of passengers on vehicle, crowding, road condition, vehicle condition, driving speed, driving performance, experience to traffic accident and vehicle's problem in last 12 months, safety concern, and overall satisfaction on the current commuting. The third part is about the workers' opinions about the current commuting condition which have 14 questions asking them about current commuting is a serious problem and better than past few years ago; appropriate supports from employers and authority; effectiveness of public bus, using bus-van, road improvement, and layby at factory; agreement on the law of limiting number of passengers on vehicle, stricter driving license, stricter vehicle's technical check, and stricter drink-driving. Since the characteristic of vehicle are difference across mode, we will ask the worker' wiliness to pay for improving general condition including seat, reducing crowded, improve vehicle condition...etc.

Table 3.2 Detail questionnaire sheet for garment and footwear workers

Questionnaires	Attribute level
Q1: What is your age?	Year
Q2: What is your monthly income?	$/month
Q3: What is your commuting vehicle mode?	Long-tailed remork, Van, Bus, Flatbed truck (1T-1.5T, 2T-2.5T)
Q4: How much do you spend for commuting?	$/month
Q5: How many minutes do you spend for one way commuting?	Minute
Q6: What is the distance between your home and factory?	Kilometer
Q7: Does your vehicle have seat?	Yes/No
Q8: How many passengers are there in your vehicle?	Person
Q9: How do you feel about that capacity?	0: Uncrowded, 1: Acceptable, 2: Crowded
Q10: What do you think about road condition?	0: Good, 1: Average, 2: Bad
Q11: What do you think about the vehicle condition?	0: New, 1: Average, 2: Old
Q12: What do you think about your driver's driving speed?	0: Acceptable, 1: Fast, 2: Very fast
Q13: What do you think about your driver's driving performance (traffic violation, overtaking)?	0: Acceptable, 1: Bad, 2: Very bad
Q14: Have you experienced to traffic accident during commuting in last 12 months?	Yes/No
Q15: Have you experienced to vehicle problems (Brake, Steering, Tyre...) in last 12 months?	Yes, No
Q16: What do you think about safety during commuting?	0: No worried, 1: Worried , 2: Very worried
Q17: Can you rate your overall satisfaction with the current commuting condition?	0: Unsatisfactory, 1: Neutral, 2: Satisfactory
Q18: What do you think about your commuting condition (safety, comfort)?	0: No problem, 1: Problem, 2: Serious problem
Q19: What do you think about commuting condition of workers in other vehicles or factories?	0: No problem, 1: Problem, 2: Serious problem
Q20: What do you think about the commuting condition between now and the past few years ago?	0: Same, 1: Better, 2: A lot better

Questionnaires	Attribute level
Q21: What do you think about employer in help solving this commuting problem?	0: Nothing, 1: Little, 2: A lot
Q22: What do you think about authority in help solving this commuting problem?	0: Nothing, 1: Little, 2: A lot
Q23: Public bus can help solving this problem.	0: Nothing, 1: Little, 2: A lot
Q24: Using bus or van can help solving this problem.	0: Nothing, 1: Little, 2: A lot
Q25: Road improvement can help solving this problem.	0: Nothing, 1: Little, 2: A lot
Q26: Layby at the factory can help solving this problem.	0: Nothing, 1: Little, 2: A lot
Q27: The law of limiting number of passengers on vehicle.	0: Disagree, 1: Neutral, 2: Agree
Q28: Stricter enforcement of driving license.	0: Disagree, 1: Neutral, 2: Agree
Q29: Stricter enforcement of vehicle's technical check.	0: Disagree, 1: Neutral, 2: Agree
Q30: Stricter enforcement of drink-driving.	0: Disagree, 1: Neutral, 2: Agree
Q31: What is the maximum additional amount of money you can pay for improving current commuting condition (seat, reducing crowding, safer vehicle…)?	$/month

3.5 Detail Questionnaires for General Drivers

In this section, we don't examine any models from the general drivers, we just create 14 questions to understand their opinions about the commuting condition of garment and footwear workers in Cambodia. We ask them 14 questions relating to the current commuting condition of garment and footwear workers such as current commuting is a serious problem and better than past few years ago; crowding; speeding; driving performance; parking during load and unload passengers; effectiveness of public bus, using bus-van, road improvement, and layby at the factory; agreement on law of limiting number of workers on vehicle, stricter driving license, stricter vehicle's technical check, and stricter drink-driving.

Table 3.3 Detail questionnaire sheet for general drivers

Questionnaires	Attribute level
Q1: What do you think about commuting condition of garment and footwear workers (safety, comfort)?	0: No problem, 1: Problem, 2: Serious problem
Q2: What do you think about the commuting condition between now and the past few years ago?	0: Same, 1: Better, 2: A lot better
Q3: What do you think about number of passengers on the vehicle?	0: Uncrowded, 1: Acceptable, 2: Crowded
Q4: What do you think about their driving speed?	0: Acceptable, 1: Fast, 2: Very fast
Q5: What do you think about their driving performance (traffic violation, overtaking…)?	0: Acceptable, 1: Bad, 2: Very bad
Q6: What do you think about their parking during loading and unloading passengers?	0: Acceptable, 1: Bad, 2: Very bad
Q7: Public bus can help solving this problem.	0: Nothing, 1: Little, 2: A lot
Q8: Using bus or van can help solving this problem.	0: Nothing, 1: Little, 2: A lot
Q9: Road improvement can help solving this problem.	0: Nothing, 1: Little, 2: A lot
Q10: The layby at the factory can help solving this problem.	0: Nothing, 1: Little, 2: A lot
Q11: The law of limiting number of passengers on vehicle.	0: Disagree, 1: Neutral, 2: Agree
Q12: Stricter enforcement of driving license.	0: Disagree, 1: Neutral, 2: Agree
Q13: Stricter enforcement of vehicle check.	0: Disagree, 1: Neutral, 2: Agree
Q14: Stricter enforcement of drink-driving.	0: Disagree, 1: Neutral, 2: Agree

3.6 In-depth Interview with Representatives from Factories and Labor Union

In this section, we will interview the representatives from factories and labor union, to get their concerns about workers' commuting condition, their suggestion, and their plans to solve this problem. For representatives from employers, we will ask them some information such as number of workers in the factory, average working hours per day, range of salary, commuting benefits, the reason why they provide and don't provide transportation for their workers, suggestions of workers, number of workers involving in traffic accident and responsibility, the turnover rate and the reason, and their future plan to improve commuting condition of workers. Similarly, most of these

questions will ask to representatives from labor union too, but we will ask for any suggestions instead of future plan.

Table 3.4 Sample of questions for in-depth interview

Q1: How many workers are there in your factory?
Q2: What is the variation in duration of working hour/day or month of your workers?
Q3: What is the range of salary of your workers?
Q4: What is the percentage of workers across commuting mode?
Q5: What is the commuting benefits that your factory provides to workers?
Q6: Why does your factory provide (not provide) vehicle to transport workers?
Q7: What are the suggestions from workers about commuting?
Q8: How many workers has involved in traffic accident since the first January 2016?
Q9: Who is responsible for these problems?
Q10: What is the turnover rate of your factory?
Q11: What is the main reasons of changing workplace?
Q12: What is your future plan to improve the commuting condition of workers?

3.7 Analysis Method

3.7.1 Data for Regression Analysis

In this study, we have several objective models or dependent variables, which come from both passengers (workers) and drivers. For drivers, the objective modes are the total fare revenue, law of limiting number of passengers on vehicle, stricter driving license, stricter vehicle check, and stricter drink-driving. The independent variables that we will include in these models are socioeconomic, and driving characteristics (see Table 3.5). For passengers, the objective model are safety concern, overall commuting satisfaction, and willingness to pay for improving commuting condition. And, the independent variables are socioeconomics, and commuting characteristics (see Table 3.6). To reach the objective of this research, a statistical program, STATA, will be used to store the data and to generate the objective model based on the regression analysis concept (linear regression, and ordered probit regression).

Table 3.5 Variables used in the regression analysis for worker-transporting drivers

Variables	Symbol	Description	Data type
Age	Age	Years	Integer
Monthly income	Inc	$/month	Continuous
Driving experience	Exp	Years	Continuous
Driving license	Lic	1= Yes, 0= No	Dummy
Appropriate driving license	App	1= Yes, 0= No	Dummy
Vehicle type	Typ	1= Van, 2=Bus, 3=Long-tailed remork, 4=Medium flatbed truck, 0= other	Nominal
Self-employment	Self	1= Yes, 0= No	Dummy
Factory paid	FaP	1= Yes, 0= No	Dummy
Technical checking	Tec	1= Yes, 0= No	Dummy
Average passenger	AvP	Person	Integer
Available seat	Seat	1= Yes, 0= No	Dummy
Driving distance	Dis	Kilometer	Continuous
Driving time	T	Minute	Continuous
Fare revenue	F	$/month/person	Continuous
Drink-driving	Drink	(0-4) Never – Everyday	Ordinal
Stopped by police	Pol	(0-4) Never – Everyday	Ordinal
Traffic accident/12 months	Acc	1= Yes, 0= No	Dummy
Law of limiting number of passengers	LLP	(0-2) Disagree - Agree	Ordinal
Total fare revenue	TFR	$/month	Continuous
Stricter driving license	DrL	(0-2) Disagree - Agree	Ordinal
Stricter vehicle check	VeC	(0-2) Disagree - Agree	Ordinal
Stricter drink-driving	DrD	(0-2) Disagree - Agree	Ordinal

Table 3.6 Variables used in the regression analysis for passengers

Variable	Symbol	Description	Data type
Age	Age	Years	Continuous
Monthly income	Inc	$/month	Continuous
Vehicle type	Type	1= Van, 2=Bus, 3=Long-tailed remork, 4=Medium flatbed truck, 0= other	Nominal
Commuting fare	F	$/month	Continuous
Commuting distance	Dis	Kilometer	Continuous
Commuting time	T	Minute	Continuous
Seat availability	Seat	1= Yes, 0= No	Dummy
Average passenger	AvP	Person	Integer
Crowding	Cro	0=uncrowded, 1=acceptable, 2=crowded	Ordinal
Road condition	RoC	0=bad, 1=average, 2=good	Ordinal
Vehicle condition	VeC	0=new, 1=average, 2=old	Ordinal
Traffic accident/12 months	Acc	1= Yes, 0= No	Dummy
Vehicle Problem/12 months	Pro	1= Yes, 0= No	Dummy
Driving speed	Spe	0=acceptable, 1=fast, 2=very fast	Ordinal
Driver performance	Per	0=acceptable, 1=bad, 2=very bad	Ordinal
Employer help	EmH	0=No, 1=Little, 2=A lot	Ordinal
Authority help	AuH	0=No, 1=Little, 2=A lot	Ordinal
Safety concern	Saf	0=no worried, 1=worried, 2= very worried	Ordinal
Overall Commuting Satisfaction	Sat	0=unsatisfactory, 1=neutral, 2= satisfactory	Ordinal
Willingness to Pay	WTP	$/month	Continuous

3.7.2 Regression Analysis

Regression analysis is a form of predictive modelling technique which navigates the relationship between dependent and independent variables by fitting a curve of line to the data point. There are various kind of regression analysis such as linear regression, logistic regression, ridge regression, lasso regression, ecologic regression, Bayesian regression, quantile regression, LAD regression, Jackknife regression...etc. To select an appropriate regression model is depend on number of independent variables, shape of the regression line, and type of dependent variable. Since there are two types of dependent variables in our research, continuous variable (total fare revenue, and willingness to pay for improving commuting condition), and ordinal variables (law of limiting number of passenger on vehicle, stricter driving license, stricter vehicle check, stricter drink-driving safety concern, and commuting satisfaction) so two different types of regression analysis are required, Linear Regression and Ordinal Regression.

Linear Regression is a statistical technique used to show the relationship between the continuous dependent variable and one or more independent variables, by fitting a linear equation to the observed data. The observed data is the summation of the estimated model and the error term, and generally written as following:

$$Y = Y + \varepsilon = \beta_0 + \sum_l \beta_i X_i + \varepsilon \qquad \text{Eq. 1}$$

Where

- Y : Observe data
- $Y = \beta_0 + \sum_l \beta_i X_i$: Estimated model, (ε : error term)
- X_i : Independent variables
- β_i : Regression coefficient of each independent variables
- β_0 : Intercept or Constance

Ordered choice model in its modern form was proposed by McElvey and Zavoina (1969, 1971, 1975) for analysis of ordered, categorical, non-quantitative choices, outcomes and responses (Greene & Hesher, 2009). Ordered choice regression are

divided in to models depending on the error term, i.e., if the error term follow the standard normal distribution, it is called Ordered Probit Regression, and if the error term follow the standard logistic distribution, it is called Ordered Logit Regression. Through literature review, probit regression are frequently used to predict the perception scale, so we will use this kind of regression as well.

The model of ordered choice model is:

$$Y_i^* = \sum_k \beta_k X_k + \varepsilon_i \qquad \text{Eq. 2}$$

Where

- Y_i^* : Latent (unobserved) variable, so the interval of latent variable into which Y^* fall (see), have to be estimated:

$$Y_i = m \quad \text{if } \tau_{m-1} \le Y_i^* = \sum_k \beta_k X_k + \varepsilon_i \le \tau_m \qquad \text{Eq. 3}$$

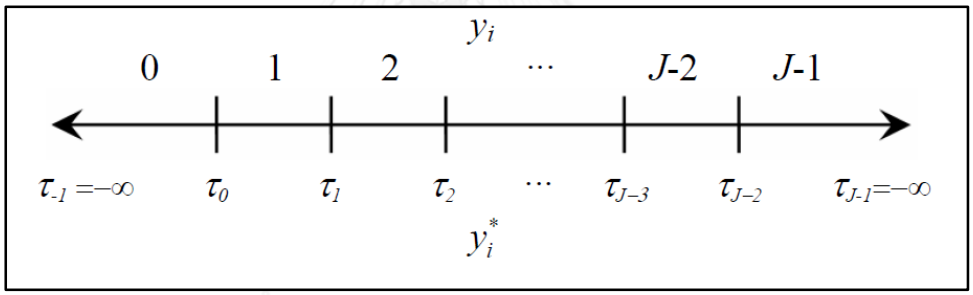

Figure 3.4 Relationship between latent and observed data

- $\mathbf{X}_k$: Independent variables
- β_k : Regression coefficient of each independent variables
- j : The number of response level or categories
- τ_m : The threshold parameters (to be estimated)
- m : the observed code discrete response

For example, $Y_i = 0$ if an individual i feels unsatisfactory with the current commuting mode, 1 if they feel acceptable, and 2 if they feel satisfactory.

These associated probability are following:

$$p_{ij} = \Pr(Y_i = j) = \Pr\left(\tau_{j-1} \le Y_i^* = \sum_k \beta_k X_k + \varepsilon \le \tau_j\right) = \Pr\left(\tau_{j-1} - \sum_k \beta_k X_k \le \varepsilon \le \tau_j - \sum_k \beta_k X_k\right)$$

$$\Rightarrow \quad p_{ij} = \Pr(Y_i = j) = F\left(\tau_j - \sum_k \beta_k X_k\right) - F\left(\tau_{j-1} - \sum_k \beta_k X_k\right) \qquad \text{Eq. 4}$$

Or we can write as: $p_{ij} = \begin{cases} \Pr(Y_i = 0 \mid X_i) = F\left(\tau_0 - \sum_k \beta_k X_k\right) \\ \Pr(Y_i = 1 \mid X_i) = F\left(\tau_1 - \sum_k \beta_k X_k\right) - F\left(\tau_0 - \sum_k \beta_k X_k\right) \\ \Pr(Y_i = 2 \mid X_i) = 1 - F\left(\tau_1 - \sum_k \beta_k X_k\right) \end{cases}$

Where p_{ij} is the probability that an individual i will select the alternative j:

$$f(\varepsilon_i) = \frac{\exp\left(-\varepsilon_i^2 / 2\right)}{\sqrt{2\pi}} \quad \Rightarrow \quad \mathrm{F}(Z) = \int_{-\infty}^{Z} f(\varepsilon_i)\, d\varepsilon = \Phi(Z)$$

The ordered regression model with j alternative will have j sets of marginal effects for an increasing of one units in a regressor X_k. The marginal effect is defined as follows:

$$\frac{\partial p_{ij}}{\partial X_{ri}} = \left[F'\left(\tau_{j-1} - \beta X_i\right) - F'\left(\tau_j - \beta X_i\right)\right]\beta_r \qquad \text{Eq. 5}$$

The marginal effects of each variable on the different alternatives sum up to zero and it represents the decrease or increase of probability of selecting alternative j expressing in percentage.

3.8 Summary and Policy Recommendations

In short, the relationship between dependent variables (total fare revenue, law of limiting number of passengers on vehicle, stricter driving license, stricter vehicle check, stricter drink-driving, safety concern, commuting satisfaction, and willingness to pay for improving commuting condition) and explained variables (socioeconomic, driving characteristics, and commuting characteristics) will be modeled by using regression

analysis under the aid of statistical program, STATA. From the model, it will show the variables that significantly affect the objective models. Moreover, each effects of these on the objective model will be explained by the marginal effect, or its coefficient. In other hand, accident analysis, the information from other stakeholders like general drivers, employers and labor unions, and regression modes will help us better understanding the existing problems and proposing good policy recommendations to improve the current commuting condition for garment and footwear workers in Phnom Penh, Cambodia.

Chapter 4

FINDINGS FROM LITERATURE REVIEW, IN-DEPTH INTERVIEW, AND ACCIDENT ANALYSIS

4.1 Findings from Literature Review

To integrate the informal public transport, there are many kind of approaches and techniques such as franchising, concessioning, quality licensing, quantity licensing, etc. (Wilkinson, 2008). From the lesson learnt from some cities in Africa, we can see that the successful regulation implementing depends on scale of intervention being appropriate to the needs and capabilities, adequate flexible timeframe, and negotiation (Schalekamp & Behrens, 2009). Moreover, mode dependency and exiting condition are also very import before formulization (Shittu, 2014; Tangphaisankun et al., 2010).

Through literature review, we found two paratransit modes that are very similar to commuting vehicle of garment and footwear workers in Cambodia, are Songthaew of Thailand, and Jeepney of the Philippines. Songthaew play as feeder in the suburb area of Bangkok, but as main public transit in other provinces of Thailand. It is under the control of Central Land Transport Control Board (CLTCB) or Provincial Land Transport Control Board (PLTCB) who determine some regulations including routes, fare, licensing period, etc. On the other hand, Jeepney has the role as public transport both provincial and urban area, especially Metro Manila. Jeepney are under the control of Land Transportation Franchising and Regulatory Board (LTFRB), but some regulations (routes, fare) are proposed by operators, and evaluate by Road Transport Planning Division (RTPD) of Department of Transportation and Communication (DOTC). For vehicle standardizing, we found several researches which proposed regulation or recommendation on vehicle checklists such as braking, steering, dimension, tires, etc. (Bacero & Vergel, 2009; Karl et al., 2015). On the other hand, financial analysis are also employed to study the sustainability of paratransit mode, FX type, (Diaz & Cal, 2005).

In case of commuting vehicles of garment and footwear workers, National Road Safety Committee (NRSC) of Interior Ministry, (Kuntear, 2016; Sotheary, 2016), proposed some policies and regulations to improve safety condition of these commuting mode such as:

- Using buses or vans to transport garment and footwear workers instead of flatbed trucks.
- Create maximum capacity limit for trucks.
- Seat regulation for flatbed trucks.
- Stricter traffic law enforcement including driving license, speeding, traffic signs, drink-driving, and seat belt.
- Train drivers about traffic law to drivers.

However, we found that most of these regulations are yet enforceable. For example, workers still have to stand during commuting. And, drivers still use flatbed trucks to transport workers without seats. Moreover, limit passengers are still violated for all kind of vehicle modes including buses, vans, and flatbed trucks. According to Agence Kampuchea Presse (AKP), there are more than 4,000 worker-transporting drivers across 14 provinces, while more than 20 percent of them operate without a license. Unfortunately, some workers-transporting drivers experienced serious loss due to the regulation of changing vehicle to use buses or van. This loss is because of loss in changing vehicle (from flatbed truck to bus, and from bus to flatbed truck), and changing to use other vehicles of workers as a result of higher fare, and unfamiliarity.

As shown in chapter 2, National Social Security Fund (NSSF), and Road Traffic Safety Team for Worker Prevention (RTSTWP) have also proposed some remedies to improve safety condition of workers such as:

- Facilitate the enterprises/establishments to record the background of worker-transporting drivers, and issue the ID card as drivers.
- Urge the enterprises/establishments to train worker-transporting drivers about traffic law.

- Collaborate with the relevant authorities with the view to restrict the reinforcement to traffic law for drivers.
- Urge worker-transporting drivers to adequately equip the accessories for their vehicles with the proper techniques.
- Increase the dissemination programs for the workers and their drivers on traffic law.
- Urge the worker-transporting drivers to attend the driving training course, take the driving exam and receive driving license in order to take the responsibility for their professions, and check their vehicles regularly.

The combination of RTSTWP's actions and new traffic laws are the two major factors lead to decrease the accident rate by 14%, workers' commuting fatalities by 12%, and serious injuries by 9%, but increase the minor injuries by 3% (RTSTWP, 2016). Without stricter traffic law enforcement, action of RTSTWP in facilitating worker-transporting drivers to get a correct driving license seems to be insignificant, as result unlicensed drivers are still high. In addition, serious commuting accidents of garment and footwear still frequently happen, and traffic law and regulations are still violated or impractical. This might be because of inadequate information related to this kind of transportation mode, and cooperation among relevant stakeholders.

4.2 Findings from In-Depth Interview

In this study, we interviewed with four representatives from factory, and one representative from labor union, CLC, in December 2016. All of the factories locate in Phnom Penh area.

For Factory 1, it also locates close to the urban area, so around 70% of workers commute to workplace by walking and motorcycle. Factory 1 provides both commuting benefit, 8$/month, and free pick if the factory's vehicles are available. This mean that the factory uses vehicles to transport their products and also workers.

Because it locates in the urban area, only 30% of workers commute to by factory vehicles, and the commuting distance is just 8km long.

Similarly, Factory 2 also locates close to the urban area, so only 40 percent of workers commute by public vehicle, mostly long-tailed remork. Moreover, the commuting distance is also short, about 3 to 16km. Even there is public bus run pass this factory, but workers don't use it because of its long waiting time and walking distance, and higher fare. Several year ago, there used to be many factories located nearby Factory 2, but most of them have moved to suburban area or provincial area due to some reasons as shown in review of current commuting condition. This factory provides commuting benefit, $7/month, as required by law.

Factory 3 locate in suburban area, so we can see that the percentage of workers commute by public vehicles is very high (50%) and the commuting distance is also very long, 40km. This factory provides 10$/month as commuting benefit to workers who commute by walking and motorcycle, but free commuting for workers commute by public vehicle by spending $25/month per workers directly to worker-transporting drivers. Another Factory also situates in the suburban area of Phnom Penh, so 65% of workers commute by public vehicle on the distance of 30km. Factory 4 provides 14$/month as commuting benefit.

From the in-depth interview with the representatives of factories, we can see that garment and footwear workers work in the range from 8 to 10 hour per day and they can earn around $160 to $250 per month. Since these factories locate in Phnom Penh area, the percentage of workers commute by public vehicle is about 30 to 65 percent with the distance around 8 to 40 kilometer, while other workers commute by private motorbike or walking. These representatives said that workers commuting with public vehicles are rarely late compare to other modes, and if late are mostly in the rainy season. Most of factories has a strict regulation of late arrival, and sometime workers are not allowed to get into the factory if they arrive late. However, some factories accept some late arrival reasons too including vehicle's problem, and congestion.

These factories has provide living and commuting bonus about $7 to 14, while the minimum bonus required by law is $7. All of these factories don't provide any parking space for public vehicles, so most of worker-transporting drivers park their vehicle on the traffic lane during load and unload workers. However, these factories have never got any suggestions from workers and also don't have any plans to improve this commuting too. In 2016, only few workers in these factories had involved in commuting accidents, most of them are slightly injuries from private mode, except factory 4 which their workers' truck got accident leading to one death and dozen injuries. Since all of these factories are member of NSSF, so treatment and other benefits are responsible by NSSF. The turnover rate are around 2% due to several reasons such as giving birth, working on their farm, changing workplace.

New factories likely to provide commuting vehicle or high commuting bonus in order to attract workers. After getting enough workers, they start to reduce expense on commuting by reduce commuting bonus to the minimum bonus required by law. And sometime they terminate long-distance workers and choose new short distance workers because they are more flexible with overtime work. Some factories provide vehicle or hired other vehicles to transport their workers, but they don't set the maximum of passengers, or appropriate number of passengers. In contrast, the factory will reduce the payment if the drivers transport less workers, i.e. if medium flatbed truck drivers transport more than 60 workers, they will get about $900 per month, unless they will get only $850.

However, we found one case that the factory want to provide vehicles to transport workers, but it's not success because of conflict with the existing drivers. This is because the factory don't hired the existing drivers, but buy their own vehicles and force the workers to use factory vehicles. Generally, worker-transporting drivers find more passengers by finding workplace for workers and provide some special promotion like free commuting during interview or free one month, so this lead to some argument when the factory force the workers to use the factory vehicles.

Table 4.1 Summary in-depth interview of representatives from factory

Questions	labor Unions	Factory 1	Factory 2	Factory 3	Factory 4
Number of workers	100,000	1000	1200	600	2,200
Working (hour/day)	8 -10	8	8 - 10	8 - 10	8 – 10
monthly salary ($)	140 - 180	160-200	200-220	220	250
Private mode (%)	Urban: 90 Suburb: 10	70	60	50	35
Public vehicle (%)	Urban: 10 Suburb: 90	30	40	50	65
Distance of public vehicle	NA	8	16	40	30
Commuting benefit ($/month)	7 - 10	8	7	10 - 25	14
Suggestion from workers	Increase benefit	No	No	No	No
Commuting injuries, deaths	NA	1, 0	4, 0	0, 0	20, 1
Treatment responsible	NSSF + Employer	NSSF	NSSF	NSSF	NSSF
Turnover per month (people)	10 - 20%	4 - 10	10 - 20	3 - 4	30 – 100
Plans to improve commuting	-	No	No	No	No

Cambodian Labor Confederation (CLC) is an independent and democratic organization, established in 2006 and registered in Ministry of Labour and Vocational Training in 2008. CLC has around 10,000 members, affiliating with three thousands unions covering eight sectors such as garment, tour and service, construction, industry, worker, transportation and informal sector (CLC, 2012).

Based on the interview with the president of CLC, the workers in garment and footwear sector work around 8 to 10 hours per day, and they can earn around $140 to $180 per month. The workers commute to work by vehicle about 10 percent if the factory situated in urban area of Phnom Penh, while they commute to work by vehicle about 90 percent if the factory situated in the suburban area. However, there are only 2 percent of factories that provide vehicles to transport their workers between home

and factory. On the other hand, workers get the bonus around $7 to $10 per month as living and commuting bonus. For Traffic accident, they don't have the exact data and recommend us to use data from NSSF. Based on RTSTWP accident data recorded from 1st January to 10th December 2016, there are 4,451 road accidents (all modes) happened to garment and footwear workers, killing 43 (RTSTWP, 2016). Commuting accident are considered as workplace accident, so the workers will get the treatment or other benefits from NSSF or from the factory. On the other hand, there are around 10 to 20 percent of workers who change workplace every month with several reasons such as relocation house, better salary, want to work with friends, or being terminated.

In his opinion, he strongly agree with traffic law enforcement, law of limiting number of passengers on vehicle, road improvement, and layby at the factory. Moreover, he has some suggestions such as provide bus to transport the workers, increase benefit for living and commuting up to $15 per month, rent room nearby the factory for workers. However, he believe that providing free pick up to workers is better than increasing commuting benefit.

4.3 Findings from Accident Causes Analysis

Out of these 30 accidents, 26 had happened in 2016 and another four case had happened in the first two months of 2017. These accidents had killed 19 people and injured another 797. 80 percent of these accident happened in the morning, and others happened in the evening. Flatbed truck shared 24 cases, and another 6 cases happened to van, bus, and long-tailed remork (2 cases each). In this case, we found that the internal causes cover about 80 percent. Finally, about 4 out 5 cases came from the drivers including speeding, overtaking, reckless, and illness. Around 70 percent of the accidents' causes are related to vehicle as well such as tyre explosion, problem of brake and steering, and overload. On the other hand, road condition is also a major cause covering nearly one-third, especially narrow road, and poor road condition.

Table 4.2 Accident cause analysis

30 Accident Data	
Time	Morning = 80%
	Evening = 20%
Case by vehicle type	Bus = 2
	Van = 2
	Long-tailed remork = 2
	Flatbed truck = 26
Victims	Fatalities = 19
	Injuries = 797
Causes	External Causes = 20%
	Internal Causes = 80%
Internal Causes	1. Drivers related = 79.2%
	2. Vehicle Related = 70.8%
	3. Infrastructure related = 29.2%

4.4 Summary

Through the literature review, there are lots of researches related to characteristics, operation, and regulations of Jeepney or Songthaew. These studies can give some good lesson learnt to Cambodia to improve commuting condition of garment and footwear workers, especially safety. However, understanding the existing characteristics, institutional capability, flexible timeframe, and negotiation are very important in formulization informal public transit. On the other hand, NRSC and NSSF have done some actions and proposed some remedies to improve safety condition for commuting vehicles of garment and footwear workers. As result, commuting accident and fatalities of workers had reduce by 14%, and 12% respectively in 2016. However, serious commuting accidents of garment and footwear still frequently happen, and traffic law and regulations are still violated or impractical. This might be because of inadequate information related to this kind of transportation mode, and cooperation among relevant stakeholders.

Based on the in-depth interview, the employers just try follow the law like providing living and commuting bonus, register as member of NSSF....etc. They will provide good condition if they want to attract more workers, especially new factory. Labor unions are also worried about commuting of workers, and they suggest to increase the commuting bonus up to $15, support public bus, or free pick up.

From accident cause analysis, we found some important points such as 80 percent of accidents happen in the morning and happed on flatbed trucks. 80 percent of these accidents caused by internal factors such as drivers, vehicle and infrastructure. Nearly 80 percent of causes are related to drivers including speeding, overtaking, reckless, and illness. And around 70 percent are related to vehicle such as tyre explosion, brake and steering's problem and overload. Nearly 30 percent are related to infrastructure like narrow width, and rough road.

Chapter 5

QUESTIONNAIRE SURVEYING OF STAKEHOLDERS

5.1 General

This chapter presents the descriptive statistics of questionnaire survey, and regression models. Data collection is done in December 2016. A total 335 data are finalized for analysis including 100 worker-transporting drivers, 155 workers, and 80 general drivers. Some challenges were confronted including, the respondents worried that I am from the governmental organization or some labor unions, the respondent found it is difficult to understand the questions, the difficulties in travelling to collect data because the collection sites are quite far from each other or in suburban area, and the expected collection site is not appropriate for collecting data. Data collection is mostly done along the main road in the suburb area of Phnom Penh where the percentage of workers commuting by public vehicle are high (see Figure 5.1).

Figure 5.1 (a) Interview sites for workers; (b) rest areas for worker-transporting drivers during day time; (c) activity during interview with workers

5.2 Descriptive statistics

5.2.1 Socioeconomic Characteristics

Table 5.1 summarizes the socioeconomic characteristics of worker-transporting drivers including age, monthly income and total fare revenue (the products of average passengers on vehicle and the average fare per passenger per month). These drivers are mostly in the range of 25 to 40 years old with the average of 36 years old. Moreover, their monthly income and total fare revenue are quite similar, but the total fare revenue is a bit higher because some drivers are hired drivers and some drivers might report their income lower than the actual. As shown in the table below, their monthly income is about $400-$500, while the total fare revenue is about $512 per month.

Table 5.1 Socioeconomic characteristics of worker-transporting drivers

Attributes	Levels	Percentage		Descriptive
Age Group	< 25 years old	7.00		Average = 36.30 Minimum = 20 Maximum = 66 Std. = 9.54
	25 – 30 years old	24.00		
	31 – 35 years old	24.00		
	36 – 40 years old	23.00		
	41 – 50 years old	12.00		
	> 50 years old	10.00		
Monthly Income and Total Fare Revenue	< $200 per month	10.00	9.00	Monthly Income Average = 400-500 Total Fare Revenue Average = 512.79 Minimum = 60 Maximum = 950 Std. = 230.07
	$200-$300 per month	13.00	11.00	
	$301-$400 per month	20.00	13.00	
	$401-$500 per month	16.00	23.00	
	$501-$600 per month	19.00	21.00	
	$601-$700 per month	9.00	7.00	
	$701-$800 per month	5.00	13.00	
	$801-$900 per month	7.00	11.00	
	> $900 per month	0.0	2.00	

Similarly, workers are about 29 years old and more than 90 percent are below 40 years old. Since the minimum wage of garment workers is $140 per month, and if we include other benefits like living-commuting benefit and regular work bonus, their monthly wage is about $160. From our data, about 80 percent of work earn about $170 - $230 per month.

Table 5.2 Socioeconomic characteristics of workers

Attributes	Levels	Percentage	Descriptive
Age Group	< 20 years old	11.61	Average = 29.16 Minimum = 17 Maximum = 46 Std. = 7.98
	20 - 25 years old	25.81	
	26 - 30 years old	21.94	
	31 - 35 years old	18.06	
	36 - 40 years old	14.19	
	> 40 years old	8.39	
Monthly Income	<$150 per month	0.65	Average = 190-210
	$151-$170 per month	7.10	
	$171-$190 per month	21.29	
	$191-$210 per month	46.44	
	$211-$230 per month	12.90	
	$231-$250 per month	4.52	
	$251-$270 per month	3.87	
	$271-$300 per month	3.23	
	>$300 per month	0.00	

5.2.2 Driving Characteristics

From Table 5.3, 80 percent of worker-transporting vehicles have annual technical check, and the rest might be expired or not yet have because it is just bought. About 45 percent of vehicles have provide seat and other 55 require passengers to stand during commuting, especially small flatbed truck. Almost of the drivers work for

Table 5.3 Technical check, seat, self-employment, paid by factory, driving experience, drink-driving, police stop, and experience to traffic accident

Attributes	Levels	Percentage
Vehicle's Technical Check	Yes	80.00
	No	20.00
Available seat on vehicle	Yes	45.00
	No	55.00
Self-Employment	Yes	92.00
	No	8.00
Fare paid by factory	Yes	22.00
	No	78.00
Driving experience	< 3 years	7.00
	3 – 5 years	26.00
	6 - 10 years	40.00
	11 – 15 years	13.00
	> 15 years	14.00
Frequency of drink driving	Never	45.00
	Few/year	8.00
	Few/month	42.00
	Few/week	5.00
Frequency of police stop	Never	80.00
	Few/year	9.00
	Few/month	11.00
	Few/week	0.00
Experienced to traffic accident in last 12 month	Yes	8.00
	No	92.00

-themselves. Only 22 percent of the drivers get the payment from the factory, and the rest have to collect fare from workers. About one third of the drivers have driving experience less than 6 years, 40 percent them have driving experience around 6 to 15

years, and the other have experience more than 15 years. There are two major groups of drink-driving, one are those who never drink alcohol and another drink about few times per month before driving, especially on paid day. 80 percent of drivers reported that they never stop by police for any check, but some driver are stopped by police about few to several time per year. However, police will stop them if they use their vehicle for other purposes. In the last 12 months, only 8 percent of these drivers had experienced to minor traffic accident.

Out of 100 worker-transporting drivers, nearly three fourth of them use small and medium flatbed trucks to transport garment and footwear workers with the average of 38 and 54 respectively. 8 of them use long-tailed remork to carry around 23 passengers. 10 percent of those use 12 to 15-seat van to transport around 25 workers, and another 9 percent use 25-35 seat bus to transport approximately 50 workers.

Table 5.4 Vehicle type and average passengers

Vehicle Type	Percentage	Average Passenger
Long-tailed remork	8.00	23 person
Van	10.00	25 person
Bus	9.00	50 person
Small Flatbed Truck	45.00	38 person
Medium Flatbed Truck	28.00	54 person

From Table 5.5, we can see 88 percent of drivers have driving license while around two-third of these drivers have only class B license, 13 percent have class C license, and other 7 percent have class D2 license. If we based on vehicle characteristics, the required driving license of each mode, long-tailed remork, van, bus, small flatbed truck, and medium flatbed truck, should be A2, D1, D2, B and C accordingly (see Figure 5.2). However, to get driving license class C, D1 or D2, the drivers must have a driving license class B. So, there are only 53 percent of worker-transporting drivers who have the appropriate driving license.

Figure 5.2 Categories of driving license in Cambodia

Table 5.5 Driving license

Distribution of Driving License (data)	
No = 12.00%	Type A = 2.00%
Type B = 66.00%	Type C = 13.00%
Type D1 = 0.00%	Type D2 = 7.00%
Require Driving License	
Long-tailed remork	A2
Van	B + D1
Bus	B + D2
Small flatbed truck	B
Medium flatbed truck	B + C
Appropriate Driving License	
Yes	53.00
No	47.00

Table 5.6 show that worker-transporting drivers drive on average 32.34 kilometer per one way trip between home and factory and spend about 80 minutes including 15 to 40 minutes pick up time. 22 percent of them get the fare from the factory, and other 78 percent have to collect the fare from worker about $11.19 per month per person.

Table 5.6 Summarize driving's distance, time and fare revenue

Attributes	Levels	Percentage	Descriptive
Fare revenue	Free	22.00	Average = 11.19 Minimum = 4 Maximum= 18
	1 - 9 $/month	18.00	
	10 - 15 $/month	59.00	
	more than 15 $/month	1.00	
Distance	less than 15km	13.00	Average = 32.34 Minimum = 2 Maximum= 80
	15 - 30km	37.00	
	31-40km	27.00	
	41-50km	10.00	
	more than 50km	13.00	
Time	less than 30 minutes	8.00	Average = 80.35 Minimum = 10 Maximum= 160
	30 - 50 minutes	14.00	
	51 - 70 minutes	24.00	
	71 - 90 minutes	20.00	
	90 – 120 minutes	22.00	
	more than 120 minutes	12.00	

Asking about acceptable fare revenues or passengers, some drivers can't answer this questions, especially those work for other people, (99 percent can answer acceptable fare revenue, but only 67 percent can answer acceptable number of passengers on vehicle). In this case, we found that the current average number of passengers on vehicle and the acceptable number are quite similar across the mode, except flatbed truck mode because this mode doesn't have seat, especially small flatbed truck. For total fare revenue, the current value and the expected value are a bit different, most of them would like to get more about $30 to $130 per month in exchange for providing a better commuting condition (i.e. reduce number of passengers, improve vehicle condition, and follow the regulations like driving license or technical check...etc.). For driving speed, we found that about half of the drivers agree that they drive in the morning faster than do in the evening. And they provide some suggestions, such as

educate motorcyclists about traffic law, and unloose the strict late arrival regulation at the factory.

Table 5.7 Number of passengers on vehicle and fare revenue

Vehicle Type	Current total fare	Accep. total fare	Accep. Passenger
Long-tailed remork	$132	$157	21 person
Van	$300	$435	26 person
Bus	$670	$808	53 person
Small Flatbed Truck	$489	$596	32 person
Medium Flatbed Truck	$686	$827	50 person

Fare competitiveness, which mean that some drivers try to reduce the commuting fare in order to attract passengers, is also a serious problem because it lead to overload in some vehicles. Moreover, some drivers try to satisfy some passengers by following their command such as speeding. Another problem arise in the evening because generally workers leave at 16:00 or 18:00, so some drivers have to come to collect workers two time, and some have to cooperate with other drivers to shear the passengers. This also leads to the problem of overload in some vehicles. Sometime, workers have to wait until 18:00, or pay more to commute with other vehicles. Sometime, workers might have to work until 20:00, but factory will use their vehicles to transport workers.

5.2.3 Commuting Characteristics

Table 5.8 show that the average number of passengers on vehicle are very similar between the reports from workers and drivers. The average passengers on each vehicle mode are 24 for van and long-tailed remork, 55 for bus, 39 for small flatbed truck, and 56 for medium flatbed truck. Out of 155 data, 4.52 percent commute by long-tailed remork, 13.55 percent commute by van, 25.16 percent commute by bus, 34.84 percent commute by small flatbed truck, and another 21.93 percent commute by medium flatbed truck.

Table 5.8 Summarize vehicle type and average passengers

Vehicle Type	Average Passengers	Percentage
Long-tailed remork	24 person	4.52
Van	24 person	13.55
Bus	55 person	25.16
Small Flatbed Truck	39 person	34.84
Medium Flatbed Truck	56 person	21.93

From Table 5.9, garment and footwear workers spend about $11 per month for commuting and they sped around one hour for one way commuting between home and factory on the distance of 24 kilometer. This result is slightly lower than those from driver data because we can't conduct the interview with longer distance workers.

Table 5.9 Summarize cost, distance, and time

Attributes	Levels	Percentage	Descriptive
Cost	Free	7.10	Average = 11.07 Minimum = 4 Maximum= 16
	1 - 9 $/month	23.87	
	10 - 15 $/month	67.10	
	more than 15 $/month	1.93	
Distance	less than 15km	10.97	Average = 24.28 Minimum = 3 Maximum= 48
	15 - 25km	52.90	
	25 - 35km	23.23	
	35 - 45km	10.32	
	more than 45km	2.58	
Time	less than 30 minutes	7.74	Average = 58.19 Minimum = 10 Maximum= 120
	30 - 50 minutes	41.29	
	51 - 70 minutes	30.97	
	71 - 90 minutes	6.45	
	more than 90 minutes	13.55	

Table 5.10 Commuting characteristics

Attributes	Levels	Percentage
Available seat on vehicle	0 = No	48.39
	1 = Yes	51.61
Experienced to vehicle's problem in last 12 months	0 = No	70.32
	1 = Yes	29.68
Experienced to traffic accident in last 12 months	0 = No	98.71
	1 = Yes	1.29
Crowded	0 = Uncrowded	21.29
	1 = Acceptable	63.23
	2 = Crowded	15.48
Road condition	0 = Almost good	36.13
	1 = Average	46.45
	2 = Almost bad	17.42
Vehicle condition	0 = New	25.16
	1 = Average	65.16
	2 = Old	9.68
Driving speed	0 = Acceptable	88.39
	1 = Fast	10.32
	2 = Very fast	1.29
Driving performance	0 = Acceptable	92.26
	1 = Bad	3.87
	2 = Very bad	3.87
Safety concern	0 = No worried	19.35
	1 = Worried	49.68
	2 = Very worried	30.97
Commuting satisfaction	0 = Unsatisfactory	17.42
	1 = Neutral	25.16
	2 = Satisfactory	57.42
Willingness-to-pay	Mean = 0.74, Min = 0, Max = 5, std = 1.02	

As shown in Table 5.10, around half of our interviewees can sit during commuting, while another half have to stand. 30 percent of them had experience to some vehicle problem especially related to tyre. However, most of them did not had any commuting accident in the last 12 months. For crowding condition, about 21 percent of these workers found think that it is uncrowded, 63 percent think that it is acceptable, and another rated to be crowded. Moreover, they think that the road is on average between bad and good condition since most of main road are in quite good condition, but local road is very bad. Around one fourth of the workers rate their commuting vehicle as new, and about two third rate on average, and another 10 percent rate as old. In reality, these new vehicles are the second hand ones imported and were made in 1992-2002 (based on answer from some drivers). Almost of the passengers think that their drivers drive very good. About one fifth of all passengers think that they don't worried about safety during commuting, but rest feel worried and very worried. In overall, more than half of the workers still feel satisfactory with the current condition, only 17 percent that rate unsatisfactory. For willingness-to-pay, workers want to pay more about $0.74 for improving the current commuting. But if we exclude 59% who don't want to pay, the willingness-to-pay of workers is about $1.8.

5.2.4 Comparing the Opinions of Workers, Worker-transporting Drivers, and General Drivers

Workers and worker-transporting drivers think that their commuting condition is a typical problem, while general drivers rate it as a serious problem. In this case, we can see that, the workers think that their drivers drive sufficiently good, and even crowded condition is acceptable. Contrary to perception of general drivers, worker-transporting drivers drive quite bad including speeding, overtaking, traffic violation, parking on road, and overcrowded. Worker and their drivers agree that the employers and the authority would support them in some forms like commuting bonus, safety and traffic law training, and relaxing some regulations. Everyone thinks that the current commuting is quite better from few years ago such as few riders sitting on roof of vehicle, reduction

of illegal attachment of vehicle, better road condition, and higher awareness of workers or drivers toward traffic accident, but traffic congestion becomes worse.

All stakeholders think that public bus is not suitable for workers even it is safe, but it is more expensive, less frequent, and lower accessible. Currently, there are three public bus routes in Phnom Penh, but garment and footwear workers don't used it because of long waiting time, and walking distance, and higher expense. Currently, public bus fare is about $0.375 per trip, so workers will spend around $18 per month, while their current commuting mode is only $11. As we know that, the segregation of factories and workers' household will require workers to change few bus routes or feeder that will lead to long commuting time and higher expense.

Using bus or van to transport workers is very good in the opinions of general driver, but not so good for workers' and their drivers' opinion. This might be because of unfamiliarity to bus or van. Based on worker-transporting drivers, bus or van has higher operation operational and initial cost. Some worker-transporting drivers experienced lost due to this regulation due to both changing vehicle expense and reduction of passengers (passengers change vehicle because of higher fare and unfamiliarity). Some drivers suggest to buy back their truck and improving road condition if the government want to issue this regulation. Some drivers also believe that truck are more efficient to drive on narrow and poor road condition including high ground clearance and less vehicle's weight. In addition, these drivers think that truck can be used to transport other goods and raw materials. Few drivers think that flatbed truck is safer due to its dual tires.

Road infrastructure improvement is unsurprisingly welcome by all, but it is costly for government. Most of the factories don't provide parking space for worker-transporting vehicles, so the drivers park on traffic lane during load and unloading passengers. In the evening, most of drivers wait their passengers in front of the factory even they are in the opposite direction. This seriously affect the traffic flow and highly expose to accident. Therefore, layby in front of factory is necessary, especially those factories

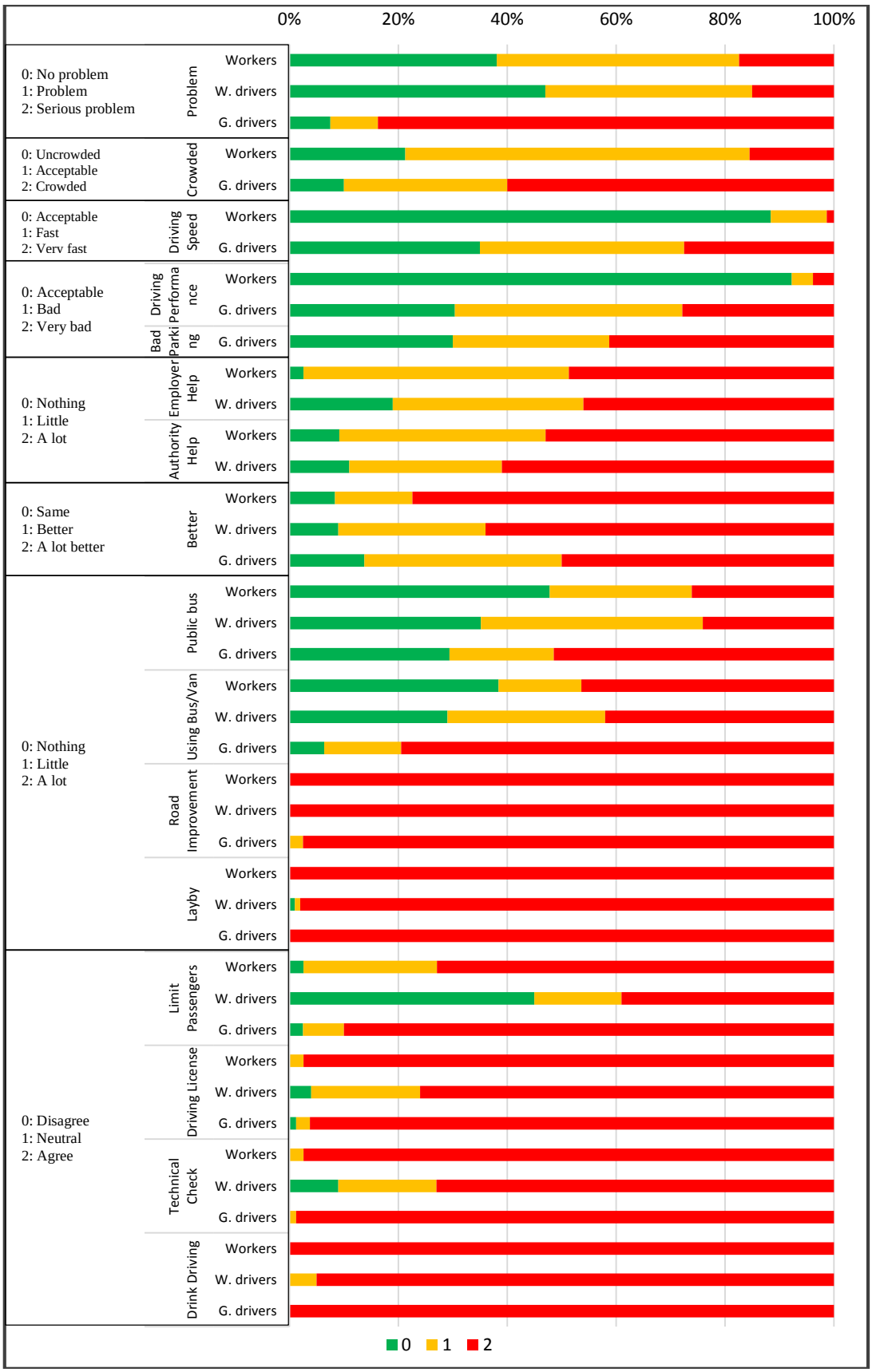

Figure 5.3 Comparison stakeholders' opinions

-located on main road. Some drivers suggest to construct the overpass or provide the traffic controller to facilitate the workers to cross the road. There are two suggestions from workers and drivers such as to expand and improve the road surface at the same time, and not to construct or maintenance the road during rainy season.

For law of limit number of passengers on vehicle, workers and general drivers think that it is necessary, but worker-transporting drivers disagree unless there are some subsidy from either employers or government. Stricter law enforcement like driving license, vehicle's technical check, and no drink-driving are also accepted by all, but worker-transporting drivers who have lower agreement level. Some drivers suggest for alcoholic and drug test, especially in the evening because they found it frequently. During interview, we also found some drivers abuse alcohol too, and this happen mostly to those drivers that don't have any job during daytime. On the other hand, most of workers said that they never noticed whether their drivers are drunk or not before getting into the vehicle, but they realize it after speeding, and bad driving performance. So workers also consider to choose other vehicles too, but it's sometime very hard to change vehicle because of unavailability, and some kind of relationship between drivers and passengers such as relatives, close friend...etc.

5.3 Regression Models for Worker-transporting Drivers

5.3.1 Total Fare Revenue Model

Total far revenue ($/month) is the multiplication of average passengers on vehicle and the average fare revenue per person. So, it is kind of continuous variable and we will generate its model by using ordinary least square (OLS). From Table 5.11, there are two models of total fare revenue. Model 1 is the fitted model of total fare revenue of all vehicle mode (N = 100), while Model 2 is the fitted model of total fare revenue of only flatbed truck in the aim of investigating the effect of the variable 'seat available'. In Model 2, we exclude van, bus, and long-tailed remork because these vehicles are always have seat for passengers.

Table 5.11 Total fare revenue model

Variables	Correlation	Model 1 (N = 100)	Model 2 (N = 73)
Constance	32.450 (0.681)	251.339 (0.000)	268.506 (0.000)
Distance (km)	3.631* (0.004)	5.641 (0.000)	5.698 (0.000)
Time (min)	0.313 (0.608)	-	-
Long-tailed remork	-127.666 (0.066)	-137.797 (0.021)	-
Van	-35.483 (0.509)	-103.986 (0.030)	-
Bus	84.268 (0.126)	224.466 (0.000)	-
Medium flatbed truck	39.673 (0.326)	180.291 (0.000)	183.536 (0.000)
Fare paid by factory	155. 286* (0.000)	135.229 (0.000)	117.571 (0.002)
Available seat	21.910 (0.555)	-	-61.356 (0.141)
Average passengers	7.839* (0.000)	-	-
Driving experience (year)	0.655 (0.743)	-	-
Appropriate driving license	-20.642 (0.511)	-	-
Technical check	-23.575 (0.513)	-	-
Self-employment	85.923* (0.045)	-	-
Frequency of drink-driving	-13.573 (0.264)	-	-
Frequency of police stop	-3.009 (0.866)	-	-
Road accident	-0.580 (0.989)	-	-
P > F(Df, N)	0.0000	0.0000	0.0000
R-square	0.8314	0.6983	0.5869
Adj. R-square	0.7989	0.6788	0.5626
Root MSE	103.16	130.38	133.02
Note: Numbers in parentheses are the corresponding p-value, star (*): significant Small flatbed truck is the basic mode			

Model 1 has three significant variables such as distant, vehicle type, and fare paid by factory. In this model, total fare revenue slightly depend on the distance which one additional kilometer of distance increase the revenue by $5.64 per month. Moreover, if the driver get the payment from the factory, they get revenue about $135 higher than those collect fare from workers. Since the average of passengers on each vehicle mode is different, so the total fare revenue of each vehicle mode is different revenue

as well. In this case, bus and medium flatbed truck driver can earn around $225 and $180 respectively, higher than small flatbed truck drivers. Contrary, van and long-tailed remork drivers earn about $104 and $138 less than small flatbed truck drivers.

Model 2 gives an important view about available seat on vehicle in addition to Model 1. However, 'seat availability' is not significant at 0.05 confident level, this's because the number of sample is too small. But, this variable will become significant if we exclude the variable 'distance' or 'fare paid by factory'. From this model, we can see that if the flatbed truck drivers provide seat to their passengers, they will lose about 60$ per month even they can increase fare. This is the reason that most of flatbed truck drivers don't provide seat to their passengers. Other variables like distance, fare paid by factory, and medium truck have quite similar coefficient to Model 1.

5.3.2 Limit Passenger Model

As shown in Framework Model (see Figure 3.1), the perception of worker-transporting drivers towards law of limit number of passengers on vehicle might depend on socioeconomic characteristics, and driving characteristics. The perception are measure on 3 likert-scale (0: disagree, 1: neutral, 2: agree). Because the dependent variable is ordinal variable, so ordered probit regression will be used to generate the model and interpret by marginal effect.

From Table 5.12, we can see that there are two models about perception of worker-transporting drivers towards law of limit number of passengers on vehicle. Model 1 shows that the drivers' perception depend on three significant variables namely fare paid by factory, distance, and van drivers. Model 2 gives us about other attributes affecting driver's perception toward law of limit number of passengers, including average number of passengers on vehicle, and frequency of drink-driving, adding to 'fare paid by factory' attribute. In model 2, the important variable that we want to mention is 'average number of passengers on vehicle' because it can represent the vehicle types, and effect of this variable on drivers' perception. In this case, worker-

transporting drivers might change the vehicle or add more vehicle if they have more passengers. However, 'frequency of drink driving' attribute is a bit insignificant since p-value = 0.064 (significance level = 0.05), or log-likelihood ratio = 3.625 (chis-square (df = 1, 0.05) = 3.84).

Table 5.12 Limit passenger model

Variables	Correlation	Model 1	Model 2
Age (year)	0.00711 (0.697)	-	-
Income ($/month)	0.00364 (0.982)	-	-
Total fare revenue ($/month)	0.00088 (0.580)	-	-
Distance (km)	-0.00947 (0.571)	-0.01810 (0.021)	-
Time (min)	-0.00231 (0.763)	-	-
Long-tailed remork	-0.41547 (0.640)	-	-
Van	0.67111 (0.322)	1.24467 (0.004)	-
Bus	-0.43070 (0.560)	-	-
Medium flatbed truck	-0.19420 (0.721)	-	-
Fare paid by factory	1.79004* (0.000)	1.77587 (0.000)	1.57332 (0.000)
Available seat	0.17837 (0.705)	-	-
Average passengers	-0.02146 (0.247)	-	-0.02314 (0.008)
Driving experience (year)	-0.00724 (0.805)	-	-
Appropriate driving license	-0.36756 (0.369)	-	-
Technical check	0.18431 (0.707)	-	-
Self-employment	-0.18582 (0.841)	-	-
Frequency of drink-driving	-0.21167 (0.181)	-	-0.22800 (0.064)
Frequency of police stop	0.10612 (0.648)	-	-
Road accident	0.67670 (0.158)	-	-
μ1	-0.70319	-0.263365	-1.03013
μ2	-0.13047	0.27474	-0.50993
P > F(Df, N)	0.0005	0.0000	0.0000
Pseudo R-square	0.2251	0.1823	0.1665
Log Likelihood	-79.0182	-83.3880	-84.9977
Note: Numbers in parentheses are the corresponding p-value, star (*): significant Small flatbed truck is the basic mode			

The interpretation of these two models are shown by the marginal effect of each attribute in Table 5.13. The most important factor affecting perception of drivers towards law of limit number of passengers on vehicle is the variable, 'fare paid by factory', because the average total fare revenue of drivers getting fare from factory is higher than those of drivers collecting fare from workers. The marginal effect of this variable from the two models are quite similar. If the drivers get the fare from factory, the average probability of agreement to this law will increase by 0.5738 (0.4593 in Model 2), but neutral and disagreement level will decrease by 0.0719 (0.0341 in Model 2), and 0.5019 (0.4934 in Model 2) respectively. Model 1 also shows that van drivers have positive perception towards law of limit number of passengers, this might be because their vehicles are quite appropriate to regulations. It means that if worker-transporting drivers are van drivers, 38.37% of them will choose Agreement, changing from Neutral 3.11% and Disagreement 35.26%. On the other hand, longer distance drivers seem to be negative to this law, since the distance has slightly influence on total fare revenue. However, the influence of distance is not strong, while the increasing of 1 kilometer of driving distance, will increase the disagreement level by only 0.55 %, but decrease the agreement level by 0.51% and neutral level 0.04%.

Table 5.13 Marginal effects of limit passenger model

Variables	Model 1			Model 2		
	0	1	2	0	1	2
Van	-0.3526	-0.0311	0.3837	NA		
Distance	0.0055	-0.0004	-0.0051	NA		
Fare paid by factory	-0.5019	-0.0719	0.5738	-0.4934	0.0341	0.4593
Average passengers	NA			0.0073	-0.0005	-0.0068
Frequency of drink-driving	NA			0.0715	-0.0049	-0.0666
0: Disagree, 1: Neutral, 2: Agree						

From Model 2, in addition to the variable, 'fare paid by factory', the drivers' agreement level to the law of limit passengers, will decrease with higher number of passengers

and more frequent drink-driving. Similar to the distance, if the number of passengers on vehicle increase by one person, the percentage of disagreement level will increase by 0.73%, but the agreement and neutral level will reduce by 0.68% and 0.05% respectively. Moreover, the increasing of drink-driving frequency by one level (never, few/year, few/month, few/week), will decrease the agreement by 6.66% and being neutral by 0.49%, but increase the disagreement by 7.15%. From this we can see that frequent drunk drivers (mostly young drivers) don't worry about safety, but they worry more about their revenue.

5.3.3 Stricter Traffic Law Enforcement Model

Similar to Limit Passengers Model, we will try to generate the relationship between worker-transporting drivers' perception towards stricter traffic law enforcement against socioeconomics and driving characteristics (see Figure 3.1). The perception of worker-transporting drivers is also measure on 3 likert-scale (0: disagree, 1: neutral, 2: agree), so ordered probit regression will used to construct the model as well. Actually, there are three dependent variables (stricter driving license, stricter technical check and stricter drink-driving) that we would like to generate the model, but we can construct only stricter driving license. This might be because the data is not enough and the variation of agreement is too small (too many respondents agree with stricter traffic law enforcement).

From Table 5.15, we can see that the drivers' perception towards stricter driving license depends on only age, where the older drivers seem likely to agree with this enforcement. From the marginal effect table, we can see that the increasing of drivers' age by one year, will decrease the disagreement and neutral level by 0.31%, and 0.8%, but increase the agreement level on 1.11%. Similar to 'drink driving frequency', these young drivers don't like regulations, especially those that might affect their revenue, because most of them might violate these laws including alcoholic and drug abuse, speeding, no driving license, etc.

Table 5.14 Stricter driving license model

Variables	Correlation	Model 1
Age (year)	0.0660* (0.010)	0.0376 (0.029)
Income ($/month)	0.2445 (0.178)	-
Total fare revenue ($/month)	0.0013 (0.480)	-
Distance (km)	-0.0287 (0.158)	-
Time (min)	0.0050 (0.598)	-
Long-tailed remork	0.2929 (0.805)	-
Van	1.3333 (0.100)	-
Bus	1.4975 (0.073)	-
Medium flatbed truck	0.7424 (0.227)	-
Fare paid by factory	0.2551 (0.632)	-
Available seat	-0.7079 (0.211)	-
Average passengers	-0.0508* (0.036)	-
Driving experience (year)	-0.0184 (0.619)	-
Appropriate driving license	1.0593* (0.019)	-
Technical check	-1.1767 (0.164)	-
Self-employment	0.3930 (0.710)	-
Frequency of drink-driving	0.5286* (0.009)	-
Frequency of police stop	-0.0908 (0.760)	-
Road accident	1.2313 (0.091)	-
μ1	-0.8593	-0.4795
μ2	0.5822	0.6124
P > F(Df, N)	0.0413	0.0198
Pseudo R-square	0.2345	0.0412
Log Likelihood	-50.4650	-63.2078
Note: Numbers in parentheses are the corresponding p-value, star (*): significant Small flatbed truck is the basic mode		

Table 5.15 Marginal effect of stricter driving license model

Variables	Driving License Model		
	0: Disagree	1: Neutral	2: Agree
Age	-0.0031	-0.0080	0.0111

5.4 Regression Models for Garment and Footwear Workers

5.4.1 Safety Concern Model

As shown in Figure 3.2, safety concern will be model in function of socioeconomics, and commuting characteristics. 3 likert-scale (0: no worried, 1: worried, 2: very worried) is employed to measure the workers' concern about safety during commuting. So, ordered probit regression will be used to generate its model, and interpret by its marginal effect.

Table 5.16 and Table 5.17 show five significant attributes and their marginal effect affecting commuting safety including crowded, driving speed, distance, bus and authority's help. The more crowded and higher driving speed will lead to higher concern about safety. But bus passengers seem less worried about safety compare to other modes. The support of authority in training worker or worker-transporting drivers about traffic law and commuting safety, have directly reduced the workers' safety concern. A bit interestingly, longer distance passengers don't worry much about safety, this might be because they have no choice and getting used to this problem.

In marginal effect, we can see that the increasing by one level of crowded (uncrowded, acceptable, and crowded), 14.23% more passengers will rate on very worried level, and these passengers might come from worried passengers about 2.54% and no worried passengers 11.69%. Likewise, the driving speed increases just one degree (acceptable, fast, and very fast), 21.22% of no worried passengers, and 4.61% of worried passengers will become very worried passengers. Contrary, if the passengers commute by bus, 12.24% of very worried passengers will change their concern to worried level by 0.95%, and no worried level by 11.29%. Moreover, 7.8% of workers who feel very

Table 5.16 Safety concern model

Variables	Correlation	Fitted Model
Age (year)	-0.0201 (0.116)	-
Income ($/month)	0.0983 (0.221)	-
Fare ($/month)	0.0260 (0.450)	-
Distance (km)	-0.0139 (0.439)	-0.0240 (0.017)
Time (min)	-0.0021 (0.728)	-
Long-tailed remork	-0.1076 (0.881)	-
Van	-0.2471 (0.679)	-
Bus	-0.8413 (0.128)	-0.4180 (0.059)
Medium flatbed truck	-0.1895 (0.604)	-
Available seat	0.2236 (0.668)	-
Crowded	0.5367* (0.004)	0.4647 (0.006)
Driving speed	0.9788* (0.024)	0.8433 (0.010)
Driving performance	0.2786 (0.545)	-
Road condition	0.1978 (0.225)	-
Vehicle condition	-0.5569* (0.007)	-
Experience vehicle's problem	-0.0113 (0.959)	-
Experience to commuting accident	0.1888 (0.846)	-
Employer's help	0.2944 (0.144)	-
Authority's help	-0.3680* (0.031)	-0.2549 (0.080)
μ1	-1.4837	-1.4976
μ2	0.1310	0.0085
P > F(Df, N)	0.0005	0.0000
Pseudo R-square	0.1457	0.0958
Log Likelihood	-134.9659	-142.8580
Note: Numbers in parentheses are the corresponding p-value, star (*): significant Small flatbed truck is the basic mode		

-worried about commuting safety will lower their concern to worried (1.39%) and no worried (6.41%) if their perception about authority's help increase by one level

(nothing, little, a lot). However, 1km increase in distance will change the worker's perception from very worried (0.74%) to worried (0.13%) and no worried (0.61%).

Table 5.17 Marginal effect of safety concern model

Variables	Safety Concern Model		
	0: No worried	1: Worried	2: Very Worried
Crowded	-0.1169	-0.0254	0.1423
Driving Speed	-0.2122	-0.0461	0.2583
Distance	0.0061	0.0013	-0.0074
Bus	0.1129	0.0095	-0.1224
Authority's help	0.0641	0.0139	-0.0780

5.4.2 Overall Commuting Satisfaction Model

Similarly, 3 likert-scale (0: dissatisfied, 1: neutral, 2: satisfied) is employed to measure overall satisfaction on current commuting condition. Ordered probit regression will be used to construct the overall satisfaction model in function of socioeconomics, and commuting characteristics. In overall commuting satisfaction model, there are four significant variables namely, crowded, driving performance, experience to vehicle's problem in last 12 months, and vehicle types. Bus and van passengers has higher satisfaction with the current commuting, compare other modes. In addition, worse driving performance and high crowded level will reduce passengers' satisfaction. Similarly, if workers experienced to vehicle's problem, they will rate their satisfaction lower because it might affect their arrival time. There are three level of crowded levels (uncrowded, acceptable and crowded) and if the increasing by one level of this attribute, 11.29% of workers satisfied with the current commuting will shift to be neutral (4.29%), and unsatisfactory (7%). Moreover, the increase by one level of driving performance (acceptable, bad, and very bad) will reduce satisfactory level by 30.94% or increase in neutral level (11.77%) and unsatisfactory level (19.17%). Similarly, if workers had experienced to vehicles' problem in last 12 months, the percentage of selecting satisfactory level will reduce about 12.61%. Compare to flatbed truck and

long-tailed remork, if worker commute to workplace by van or bus, they will likely to select satisfactory level with the average percentage of 23.45% and 26.33% respectively.

Table 5.18 Overall commuting satisfaction model

Variables	Correlation	Fitted Model
Age (year)	-0.0209 (0.129)	-
Income ($/month)	0.0589 (0.513)	-
Fare ($/month)	-0.0316 (0.398)	-
Distance (km)	-0.0004 (0.982)	-
Time (min)	0.0050 (0.469)	-
Long-tailed remork	0.6803 (0.340)	-
Van	1.1632 (0.064)	0.7734 (0.022)
Bus	1.2134* (0.032)	0.8419 (0.001)
Medium flatbed truck	0.2086 (0.579)	-
Available seat	0.2356 (0.651)	-
Crowded	-0.5030* (0.010)	-0.3475 (0.046)
Driving speed	-0.3309 (0.387)	-
Driving performance	-0.8431* (0.015)	-0.9524 (0.001)
Road condition	-0.1007 (0.949)	-
Vehicle condition	0.1130 (0.598)	-
Experience vehicle's problem	-0.3712 (0.106)	-0.3882 (0.069)
Experience to commuting accident	-6.4838 (0.977)	-
μ1	-1.9184	-1.3431
μ2	-0.9175	-0.4245
P > F(Df, N)	0.0000	0.0000
Pseudo R-square	0.2023	0.1434
Log Likelihood	-119.9527	-128.8118
Note: Numbers in parentheses are the corresponding p-value, star (*): significant Small flatbed truck is the basic mode		

Table 5.19 Marginal effect of overall commuting satisfaction model

Variables	Overall Commuting Satisfaction Model		
	0: Unsatisfactory	0: Neutral	0: Satisfactory
Crowded	0.0700	0.0429	-0.1129
Driving performance	0.1917	0.1177	-0.3094
Experience to vehicle's problem	0.0782	0.0479	-0.1261
Van	-0.1214	-0.1131	0.2345
Bus	-0.1415	0.1218	0.2633

5.4.3 Willingness To Pay Model

In this thesis, the willingness-to-pay or WTP ($/month) is used to measure the workers' maximum additional amount of money for overall improvement such as seat, reducing crowding, improving vehicle condition, etc. We measure the willingness-to-pay for overall improvement because, there are many vehicle mode with different characteristics. Since, willingness-to-pay is kind of continuous variable, so, linear regression is used once again to generate WTP model.

In Table 5.20, we construct two models of worker's willingness-to-pay for improving the current commuting condition. Model 1 is just to provide the relationship between the workers' WTP in function of their concern about safety and their overall commuting satisfaction. In this model, the higher concern about safety and the less satisfaction are willing to pay more. On the other hand, Model 2 shows us that workers want to pay more about $0.96 for seat, and $0.45 for reducing number of passengers on vehicle.

Table 5.20 Willingness-to-pay model

Variables	Correlation	Model 1	Model 2
Age (year)	0.0008 (0.934)	-	-
Income ($/month)	0.0631 (0.269)	-	-
Fare ($/month)	-0.0026 (0.913)	-	-
Distance (km)	0.0069 (0.566)	-	-
Time (min)	0.0018 (0.674)	-	-
Long-tailed remork	0.1973 (0.699)	-	-
Van	-0.1946 (0.646)	-	-
Bus	0.1993 (0.614)	-	-
Medium flatbed truck	-0.1114 (0.663)	-	-
Available seat	-0.8908* (0.015)	-	-0.9605 (0.000)
Crowded	0.2808* (0.034)	-	0.4476 (0.000)
Driving speed	-0.4405 (0.091)	-	-
Driving performance	0.3515 (0.108)	-	-
Road condition	-0.2048 (0.067)	-	-
Vehicle condition	-0.0453 (0.758)	-	-
Experience vehicle's problem	0.1812 (0.253)	-	-
Experience to commuting accident	-0.6752 (0.332)	-	-
Safety Concern	0.2136* (0.049)	0.2521 (0.021)	-
Commuting Satisfaction	-0.3180* (0.004)	-0.4608 (0.000)	-
Constance	(0.133)	1.0992	0.8096
P > F(Df, N)	0.0000	0.0000	0.0000
R-square	0.4078	0.1698	0.2974
Adj. R-square	0.3244	0.1589	0.2881
Root MSE	0.83559	0.9324	0.8577
Note: Numbers in parentheses are the corresponding p-value, star (*): significant Small flatbed truck is the basic mode			

5.5 Summary

This chapter summarizes the descriptive statistics and regression models from questionnaire survey with stakeholders. The survey was done in December 2016 in the metropolitan area of Phnom Penh. 335 respondents are interviewed on site including 100 worker-transporting drivers, 155 garment and footwear workers, and 80 general drivers.

Worker-transporting drivers are about 36 years old, with driving experience of 9 years. These driver earn about $400 - $500 per month from fare collection. Driver spend about 80 minutes per one-way trip on the distance of 32, while they can charge for $11 per month per person. Most of drivers have driving license, but only 53% of them have the correct driving license. About half of drivers respond that they abuse alcohol about few time per month, but only few of them have encountered by police for any checks. From the regression model, total fare revenue depend on distance, vehicle mode, fare paid by factory, and seat availability. Since distance has slightly influence on fare revenue, so longer distance drivers feel negative to the law of limit passengers. Contrary, drivers who get fare from factory can earn more than those colleting from workers, so they agree with the law of limit passenger. Moreover, van drivers feel more positive to this law compare to other mode drivers. From the driving license model, we can see that older drivers likely to agree with stricter driving license.

Garment and footwear workers are about 29 year old, and ear about $170 - $210 per month. The percentage of our respondents are 4.5%, 13.6%, 25.2%, 34.8%, and 21.9%, from long-tailed remork, van, bus, small flatbed truck, and medium flatbed truck respectively. The average passengers on these vehicle modes are 24, 24, 54, 39, and 56. About half of passengers have to stand during commuting, and one third of them had experienced to vehicle's problem in 2016. Nearly 60 percent of these workers feel satisfied with the existing commuting condition, but they still expect safer condition. Their concern about safety affect by driving speed, and crowded condition, but this concern reduce by the help from authority including training, and raising awareness of

traffic accident. Bus passengers feel less concerned compare to other modes. From overall commuting satisfaction model, bus and van passengers feel more satisfied with the commuting, but crowded condition, bad driving performance, and experience to vehicle's problem are the factors affecting their satisfaction. To improve the current commuting condition, workers want to pay more $0.74 per month.

Workers and worker-transporting drivers think that their commuting condition is a typical problem, while general drivers rate it as a serious problem. In this case, worker think that their drivers drive sufficiently good, and even crowded condition is acceptable. Contrary, general drivers think that worker-transporting drivers drive badly including speeding, overtaking, violating traffic law, parking on road, and overcrowded. Worker and their drivers agree that the employers and the authority would support them in some forms for like commuting bonus, safety and traffic law training, and relaxing some regulations. Everyone think that the current commuting is better than past few years. Public bus is supposed to be not suitable for workers but using bus or van is quite good. Road infrastructure improvement is unsurprisingly welcome by all but it is costly to government. Traffic law enforcement is seem to be accept by all except limit number of passengers because it will affect the worker-transporting drivers' income.

Chapter 6
POLICY RECOMMENDATIONS

6.1 Management System and Regulations

Based on literature review, in-depth interview, and questionnaire survey, we recommend that National Social Security Fund (NSSF) should control worker-transporting vehicles by creating registration database, and some basic regulations.

Through the literature review, successful integration of informal public transit depends on mode dependency, adequate timeframe, negotiation, and scale of intervention. From the review of garment and footwear industry, the average growth of this sector is about 15% in term of employment or export value, and is expected to grow until 2018. At the end of 2015, there are 699 factories which employ 620,000 workers (ILO, 2016). Currently, NSSF reported that there are about 4000 worker-transporting vehicles, and the percentage of workers commuting by these vehicles is about 32.66% (RTSTWP, 2015, 2016). Based on our survey, around 27.45% of garment and footwear workers commute to workplace by these vehicles, including vans, buses, flatbed trucks, and long-tailed remorks. Garment and footwear workers will still depend on this commuting mode because of unsupported public bus in the suburban area, and advantage of worker-transporting vehicles. In addition, the share of this commuting mode might increase due to factory deconcentration policy, road improvement, and greater number of operators. However, unregulated and unsupervised informal public transportation is unsustainable and produce unwanted outcomes such as accident, congestion, and pollution (Cervero, 2000; Shittu, 2014).

From the review about solution of commuting problem, we found that commuting accident are considered as workplace related accident which responsible by NSSF, while employers have to register and pay contribution to NSSF. Moreover, NSSF is a governmental organization, and have good relationship with other parties including ministries, labor unions, employer association, and some international organization.

Especially, NSSF has created a team, Road Traffic Safety Team for Worker Prevention (RTSTWP), who work related to commuting of workers including training about traffic law, collecting related commuting accident data, and analysis the accident causes. So, NSSF well understand this existing commuting condition, and has adequate ability to control this commuting mode.

However, NSSF has recommend the employers to control these drivers, but we think it's not work. From questionnaire survey, most of worker-transporting drivers collect fare from workers, so the employers have no power on these drivers. From in-depth interview, we can see that employers don't have any concern about commuting of their workers, and they just follow the law like providing commuting bonus ($7/month), and pay contribution to NSSF. However, even the factory hired the drivers to transport their workers, most of them still require these drivers to transport many workers unless they will reduce the payment.

Moreover, enforcement alone from police officers is not enough because it's hard to stop a vehicle full of workers for any checks, and most of proposed regulations by authority are still violated. As shown in Table 5.3, 80% of drivers never stopped by police officer. So, the combination of regulation from NSSF and police officer is necessary to successfully control this commuting mode. However, some regulations might lead to the resistance from drivers, so the authority should consider some options to compensate the revenue of these drivers such as subsidy or allowing them to transport general passengers, creating part-time jobs for them during daytime (especially long distance drivers).

6.2 Training and Disseminating

From literature review, and regression model, we encourage the authority and NSSF to continue their training and disseminative program, and to extend this program to general motorcyclists.

From the literature review, RTSTWP has planned to trained and facilitate all worker-transporting drivers to get the appropriate driving license in 2016. So, they had prepared driving examination 35 times in 2016 to 2712 drivers, but only 1746 have passed (include driving license D2 = 409), even though these actions has done since 2013. From our data, nearly 90 percent of drivers have driving license, but only 53 percent of them have the correct one. This because some drivers failed the exam or missed to take it. Beside preparing training course, driving exam and driving license provision for worker-transporting drivers, RTSTWP have disseminated traffic law and safety to 20,000 workers and trained 380 principal trainers from labor unions, trade union staffs, and factory administrators. From the questionnaire survey and regression model, these actions are very acceptable by drivers, and directly reduce the workers' concern about commuting safety. In addition, the combination of RTSTWP's actions and new traffic laws are the two major factors lead to decrease the accident rate by 14%, workers' commuting fatalities by 12%, and serious injuries by 9%, but increase the minor injuries by 3% (RTSTWP, 2016).

However, without controlling institution and enforcement, these actions seem to be ineffective because some worker-transporting drivers don't really care about these supports. Moreover, some worker-transporting drivers suggest to educate and train motorcyclists who are the main reason of traffic accidents.

6.3 Safe Vehicle

From chapter 4 and chapter 5, we recommend two regulations such as seat regulation and standardizing vehicle's components. However, using bus/van to transport workers and public bus seem to be infeasible.

From the regression analysis, we found that workers are willing to pay more for seat, and reducing crowded level. On the other hand, their willingness-to-pay also have correlation with safety concern and commuting satisfaction. Moreover, workers' concern on commuting safety is related to the high level of crowdedness, high driving

speed, and worse condition of other vehicle modes beside bus. In addition, 70% of accident is related to vehicle including vehicle defects (steering, brake, tyre...etc.), and capacity (overload, and high jerking from standing passengers). Therefore, seat regulation is very necessary for flatbed truck. This regulation is very feasible and easy to enforce, since workers also want to pay more, and some drives can do this. With seat, small flatbed truck can transport around 32 passengers (no seat=40) while medium flatbed truck can transport about 45 passengers (no seat=58). At this number, it very appropriate their allowable load capacity. Standing passengers increase the jerking condition of vehicle, and overload that lead to high risk of overturn. Especially, seat regulation might lead to better service quality competition instead of existing fare competition.

Standardizing vehicle components of vehicle is also important since all vehicles are imported second-hand and quite old (most were produced in 1992-2002). Steering system, brake system, tyre, suspension, and chassis are quite expired and might be fake. Some extending chassis has been place to transport more workers. From accident cause analysis, 70% of commuting accidents are related to vehicle's problem including tires explosion, suspension failure, steering and brake system's problem, etc. In this case, regulations of Jeepney of the Philippines might be a good lesson learnt and guideline for Cambodia. Moreover, some recommendations on standardizing vehicle components of Jeepney (Bacero & Vergel, 2009; Karl et al., 2015) are also applicable to flatbed trucks.

The regulation of using bus or van to transport workers seems to be unsuccessful due to high cost and unfamiliarity of worker. However, bus and van passengers have high satisfaction (good for protect passengers from dust, rain and coldness) and less concern about safety for bus passengers. A van can carry small number of passengers, so the drivers get lower revenue although it has shorter pickup time. A bus can transport a number of workers similar to medium flatbed truck but it consumes more fuel, has higher initial and maintenance cost. Moreover, flatbed truck can also be improved to that condition, and some drivers think that a flatbed truck is safer than bus or van

because of dual tires. Moreover, a truck can be used in other purposes like transporting goods, and raw materials. Most drivers think that a truck is more efficient to drive on narrow and poor road condition (higher ground clearance height and less body weight). Some drivers suggest the government to buy back their trucks and improve the road condition if they want to enforce this regulation. Because of this regulation, some drivers had changed to use bus for transporting workers, and put them in serious lost.

Public bus system seems to be infeasible because of some reasons. First, the segregation of household and factories in the suburban area will require workers to transfer many times to arrive the destination, leading to higher cost and time. There are three routes of public bus in Phnom Penh, but workers still don't use it because of long walking distance to the bus station, long waiting time, and high cost. The current fare of public bus is about $0.375 per trip, so workers would have to spend at least $18 per month on commuting, while they spend only $11 with their current mode.

6.4 Traffic Law Enforcement

From in-depth interview, questionnaire survey, and accident cause analysis, we recommend to undertake random alcoholic and drug test, and enforce traffic law including driving license, technical check, and seat regulation. For speed enforcement and limit number of passengers on vehicle, we think that it's not necessary.

From the interview, all stakeholders also welcome stricter traffic law enforcements including driving license, vehicle's technical check, and drink-driving, but worker-transporting drivers have quite low agreement level compare to other. Random Breath Test (RBT) and drug check should be done especially in the evening, and it was also suggested by some worker-transporting drivers too. From questionnaire survey, more than half of drivers are young (less than 35) and these young drivers are recorded to drink alcohol quite often before driving, at least few times per month. But we believe that the actual frequency of alcohol abuse would be more frequent, especially those who don't have other job. Most workers said they never notice whether their drivers

are drunk or not, before getting into the vehicle, but they realized it by bad driving performance, so they are very worried about safety. Workers don't have many options to choose other vehicles due to unavailability, and relationship between workers and drivers (friend, relative...etc.), so workers hardly change to other vehicles. In addition, some other enforcements like driving license, seat regulation, and technical check should be done along with RBT as well.

About 80 percent of accidents are related to drivers especially speeding, but speed enforcement might not be necessary because of several reasons. First, the accident may related to other causes such as overloaded standing passengers, vehicle defect and inappropriate road condition. Most of accidents had happed in the morning, while around half of drivers agree that they drive in the morning faster than do in the evening. From in-depth interview, worker-transporting drivers rarely arrive late. These drivers risk to speed up in the morning because of the strict late arrival regulation at the factory. So, revising the strict late arrival regulation, and raising the awareness of speed up to both drivers and workers might be more effective.

Law of limit passengers on vehicle is very controversial since it will strongly affect the drivers' revenue. This regulation is applicable unless there are some subsidy from factory or government. Some drivers and workers were asked about appropriate number of passengers on vehicle, but they give the result which are very close to the current average number. For flatbed truck, seat regulation seems to give an appropriate number of passengers which are 30 for small flatbed truck, and 45 for medium flatbed truck. For other modes like bus and van, if we limit to the original seat, it will not acceptable, so authority should negotiate with these drivers to revise the layout of seat in these vehicles. Financial analysis should be done with the parameter of seat or number of passengers on vehicle to secure the sustainability of operators.

6.5 Road Infrastructure

From survey questionnaire, and in-depth interview, we suggest to construct layby, construct overpass in front of factory or provide traffic controller, and improve road condition, especially main road.

From site observation, most of factories don't provide any parking space for worker-transporting vehicles, so they have to park on traffic lane during loading and unloading passengers. This seriously affects the traffic flow and highly exposes to accident. Therefore, layby in front of factories is necessary, especially those factories locate on main road. Some drivers suggested the construction of overpass to facilitate workers to cross the road. Otherwise, the factories should provide some traffic controllers to help workers crossing the road safely. Moreover, government should consider some road improvements such as road maintenance, road expansion, adding median, installing traffic signal, speed bump, and traffic signs. Most drivers suggest to improve road surface and expand at the same time, but do it only in the dry season.

6.6 Summary

Through the findings from literature review, in-depth interview, questionnaire survey, regression model, and accident cause analysis, we recommend some policies grouping into five categories including management system and regulation, training and disseminating, safe vehicle, traffic law enforcement, and road infrastructure. First of all, we recommend NSSF to control the worker-transporting vehicles by creating registration database, and some basic regulations for vehicle. Second, we encourage the authority and NSSF to continue their training and disseminating program, and to extend this program to general motorcyclists. In term of safe vehicle policy, we recommend seat and standardizing vehicle's components regulations. Moreover, the authority should undertake random alcoholic and drug test, and stricter enforce the traffic law such as driving license, technical check, and seat regulation. Finally, the government should improve road condition, and urge employers to construct layby in front of factory and provide traffic controllers to facilitate workers crossing road safely.

Chapter 7
SUMMARY AND COMCLUSION

7.1 Summary

7.1.1 General

This study aim to understand the characteristics of worker-transporting vehicles and prioritize some Cambodian policies for improving commuting condition of garment and footwear workers in the metropolitan area of Phnom Penh. To reach these two objectives, we have done five continuous steps such as review past researches about integrating informal public transit, conduct in-depth interview with representatives of factory and labor union, interview relevant stakeholders with questionnaire sheet, generate some regression models, and analyze the causes of commuting accident. In this study, we classify the worker-transporting vehicles into 5 groups (buses, vans, small flatbed trucks, medium flatbed trucks, and long-tailed remorks) depend on its similarity, population, and size. Questionnaire sheet compose of three parts such as socioeconomic characteristics, driving/commuting characteristics, and opinions, but only opinions part is used to interview general drivers. From the questionnaire survey, we will construct the regression models of total fare revenue, traffic law enforcement, safety concern, overall commuting satisfaction, and willingness-to-pay. Since our objective variables are continuous and ordinal, so OLS and ordered probit regression will be used to generate the models under the aid of a statistical software package, STATA. In December 2017, 340 respondents were interviewed including 155 workers, 100 worker-transporting drivers, 80 general drivers, 4 representatives from factory, and one representative from labor union. On the other hand, 30 recent serious accidents of worker-transporting vehicles had been recorded from some local and international news agencies for cause analysis.

7.1.2 Characteristics of and Stakeholders' Opinions on Commuting Condition of Garment and Footwear Workers

On average, worker-transporting drivers are 36 years old, and their total fare revenue are $132, $300, $670, $490, and $690 per month if they drive long-tailed remork, van, bus, small flatbed truck, and medium flatbed truck respectively. For garment and footwear workers, they are about 29 years old, and earn around $170 - $210 per month. The average number of passengers vehicle are about 25 for van and long-tailed remork, 40 for small flatbed truck, and 55 for bus and medium flatbed truck. Around half of passengers need to stand about one hour during commuting between home-factory on the distance of 30-km. Most of driver have to collect fare from workers about $11 per month per person, and they transport workers for several factories. More than half of garment and footwear workers feel satisfied with the current commuting, but they still expect a safer condition, and they would like to pay more $0.74 for improving the current condition.

In comparing the opinions of all stakeholders, we can see that employers think that the commuting of their workers are not a problem, but workers and their drivers rate it as a typical problem while labor union and general drivers rate it as a serious problem. However, all stakeholders agree that the current commuting condition are better than past few years. In the opinions of workers, they think that their drivers sufficiently good, even the crowded condition is acceptable. Contrary, general drivers think that worker-transporting drivers drive quite badly including speeding, overtaking, violating traffic law, parking on road, and overcrowding. To improve the current commuting condition, labor union has some suggestions such as support public bus, use bus/van to transport workers, increase commuting bonus or free pick up, rent room nearby the factory for workers, and enforce traffic law. But, the employers have no plans for improving commuting of their workers, and they just follow the law. But in the opinions of others stakeholders, public bus is not suitable, but using bus/van is quite good. Most of traffic law enforcements are accepted by all stakeholders but worker-transporting drivers has a lower agreement level, especially some regulations

that might affect their fare revenue. Road improvement is unsurprisingly welcome but it's costly.

According to traffic accident data, we can see that 80 percent of accidents had happened in the morning, and flatbed truck is the most dangerous mode (26 cases out of 30 accidents). 80 percent of the accidents causes from three factors such as drivers, vehicle and road infrastructure. 4 out of 5 accidents are related to drivers including speeding, overtaking, reckless, and illness. Around 70% are related to vehicle such as tyre explosion, problem of brake and steering, and overload. Narrow road and poor road condition have caused the accident around 30% as well.

From total fare revenue model, we found three important variables 'fare paid by factory', 'distance' and 'available seat'. If the worker-transporting drivers get fare from factory, they likely earn about $135 higher than those collect from workers. In this case, we can see that total fare revenue slightly depend on distance, around $7 per additional kilometer long. Moreover, if the flatbed truck drivers provide seat on their vehicle, they seem to lose around $61 per month even they can increase fare. If we look into limit passenger model, we can see the connection between total fare revenue and perception of drivers towards law of limit passenger. In this case, we can see that long distance drivers and those collect fare from workers feel negative to this law. Similarly, frequent drunk drivers also disagree with this law, but van drivers seem to be positive. For other traffic law enforcements (driving license, technical check and drink-driving) are accepted by all drivers.

Based on the regression model of safety concern, we can see that worker's concern is impacted by speeding, and crowded condition. But this concern reduce by authority's help in training their drivers about traffic law and commuting safety. However, bus passengers feel safer than passengers in other vehicle modes. Interestingly, longer distance passengers seem to less concerned, this might be because they have no choice, and getting used to this problem. From overall commuting satisfaction model, bus and van passengers feel more satisfied than passengers of other vehicle modes,

but their satisfaction level will reduce with worse driving performance, overcrowding, and experience to vehicle's problem. However, only 41% of workers want to pay more about $1.8 per month for seat, and reduce crowded level.

7.1.3 Policy Recommendations

From past researches about formulizing informal-public transit in developing countries, key success depends on well understand the exiting characteristics, institutional capacity, flexible timeframe, and adequate negotiation with relevant stakeholders. Regulations of Jeepney of the Philippines and Songthaew of Thailand has quite similar characteristics worker-transporting vehicles in Cambodia, so the lesson learnt from these modes can apply to Cambodia. Even though, we still need to adjust it to fit in situation of Cambodia. Moreover, several searches about vehicles' component standardizing of Jeepney can be applicable to flatbed truck of Cambodia too.

From the findings above, we recommend some policies grouping into five categories including management system and regulation, training and disseminating, safe vehicle, traffic law enforcement, and road infrastructure. First of all, we recommend NSSF to control the worker-transporting vehicles by creating registration database, and some basic regulations for vehicle. Second, we encourage the authority and NSSF to continue their training and disseminating program, and to extend this program to general motorcyclists. In term of safe vehicle policy, we recommend seat and standardizing vehicle's components regulations. Moreover, the authority should undertake random alcoholic and drug test, and stricter enforce the traffic law such as driving license, technical check, and seat regulation. Finally, the government should also improve road condition, and urge employers to construct layby in front of factory or provide traffic controllers to facilitate workers crossing road.

7.2 Conclusion

In conclusion, this study has investigated several factors including review previous study, interview representatives from factories and labor union, interview

workers/worker-transporting drivers/general drivers, and analysis accident causes, before providing some recommendation to improve commuting safety for garment and footwear workers. To the author, this study is the early stage of integrating the commuting vehicles of garment and footwear worker in Phnom Penh metropolitan area. Moreover, the findings from this research can benefit to government in aim of controlling other transportation modes, to secure the safe, affordable, accessible, and sustainable transportation system towards the high growth of economic and population in Phnom Penh.

7.3 Limitation and Future Study

This research has some limitations including error in categorizing vehicle group, dispersion of workers, data error of answering the questions, inappropriate accident data, and limit proposed idea. For example, there are several kind of vans (12, 13, and 15 seats), bus (25, and 35 seats), small flatbed truck (1, 1.25, 1.4, 1.5 ton load capacity), and long-tailed remorks. The number of sample can't fulfill the requirement by regression analysis. The distribution of sample from workers is not so good because we had conducted the interview in only some range of distance.

Furthermore, this research could extend to some further researches such as prioritization the traffic safety policies or regulations, cost-benefits analysis of each vehicle mode, appropriate number of passenger on vehicle, standardizing vehicle, etc. Moreover, it could expand the scope of the study to other similar commuting mode such as construction workers, and students.

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APPENDIX

Chulalongkorn University and AUN/SEED-Net JICA
Faculty of Engineering
Civil Engineering Department

Survey questionnaire of commuting of garment and footwear workers in Phnom Penh

_____Worker-transporting driver_____

❖ **Socioeconomic**

1 How old are you? _____Year
2 What is your monthly income? ☐ <$200 ☐$201-$300 ☐$301-$400 ☐$401-$500 ☐$501-$600 ☐$601-$700 ☐$701-$800 ☐$801-$900 ☐ >$900

❖ **Driving Characteristics**

3 How long have you work as drivers? _____Year
4 What type of driving license do you have? ☐ A1, ☐ A2, ☐ B, ☐ C, ☐ D1, ☐ D2
5 What is your vehicle type? ☐ Long-tailed remork, ☐ Van ☐ Bus, ☐ Small flatbed truck, ☐ Medium flatbed truck
6 Do you work for yourself? ☐ Yes ☐ No
7 Do you get fare from factory? ☐ Yes ☐ No
8 Do you have vehicle's technical check? ☐ Yes ☐ No
9 What is the average passengers in your vehicle? _____person
10 Does your vehicle have seat? ☐ Yes ☐ No
11 How far do you drive for one-way trip? _____kilometer
12 How many minutes do you spend per trip? _____minutes
13 How much do you charge from worker? _____$/month/person
14 How often do you drink and drive? ☐ Never ☐ Few/year ☐ Few/month ☐ Few/week ☐ Everyday
15 How often were you stopped by police for check? ☐ Never ☐ Few/year ☐ Few/month ☐ Few/week ☐ Everyday
16 Have you experienced to driving accident in last 12 months? ☐ Yes ☐ No

❖ **Opinions about commuting condition**

17 What do you think commuting condition of workers in your vehicle (safety, comfort)? ☐ No problem ☐ Problem ☐ Serious problem
18 What do you think commuting condition of workers in other vehicles (safety, comfort)? ☐ No problem ☐ Problem ☐ Serious problem

19 What do you think about the commuting condition between now and past few years ago? ☐ Same ☐ Better ☐ A lot better

20 What do you think about employer in help solving this problem?
☐ Nothing ☐ Little ☐ A lot

21 What do you think about authority in help solving this problem?
☐ Nothing ☐ Little ☐ A lot

22 Can public bus help solving this problem? ☐ Nothing ☐ Little ☐ A lot

23 Can bus or van help solving this problem? ☐ Nothing ☐ Little ☐ A lot

24 Can road improvement help solving this problem? ☐ Nothing ☐ Little ☐ A lot

25 Can layby at factory help solving this problem? ☐ Nothing ☐ Little ☐ A lot

26 What do you think about law of limit passengers on vehicle?
☐ Disagree ☐ Neutral ☐ Agree

27 What do you think about stricter enforcement of driving license?
☐ Disagree ☐ Neutral ☐ Agree

28 What do you think about stricter enforcement of vehicle's technical check?
☐ Disagree ☐ Neutral ☐ Agree

29 What do you think about stricter drink-driving?
☐ Disagree ☐ Neutral ☐ Agree

30 What is your minimum total fare revenue, if you were enforced to provide seat, and stricter law enforcement? _____ $/month

Thank you for your participation!

Chulalongkorn University and AUN/SEED-Net JICA
Faculty of Engineering
Civil Engineering Department

Survey questionnaire of commuting of garment and footwear workers in Phnom Penh

_____Garment and footwear workers_____

❖ **Socioeconomic**

1 How old are you? _____Year
2 What is your monthly income? ☐ <$150 ☐$151-$170 ☐$171-$190 ☐$191-$210 ☐$211-$230 ☐$231-$250 ☐$251-$270 ☐$271-$300 ☐ >$300

❖ **Commuting Characteristics**

3 What is your vehicle type? ☐ Long-tailed remork, ☐ Van ☐ Bus, ☐ Small flatbed truck, ☐ Medium flatbed truck
4 How much do you spend for commuting? _____$/month
5 How many minutes do you spend for one-way commuting? _____minutes
6 What is the distance between your home and factory? _____Year
7 Does your vehicle have seat? ☐ Yes ☐ No
8 How many passengers are there in your vehicle? _____person
9 How do you feel about that number of passengers?
☐ Uncrowded ☐ Acceptable ☐ Crowded
10 What do you think about road condition? ☐ Good ☐ Average ☐ Bad
11 What do you think about vehicle condition? ☐ New ☐ Average ☐ Old
12 What do you think about driving speed? ☐ Acceptable ☐ Fast ☐ Very fast
13 What do you think about driving performance (overtaking, traffic violation)?
☐ Acceptable ☐ Bad ☐ Very bad
14 Have you experienced to vehicle's problem (tyre, steering, etc.)? ☐ Yes ☐ No
15 Have you experienced to commuting accident in last 12 months? ☐ Yes ☐ No
16 What do you think about safety during commuting?
☐ No worried ☐ Worried ☐ Very worried
17 Can you rate your overall satisfaction with the commuting condition?
☐ Unsatisfactory ☐ Neutral ☐ Satisfactory

❖ **Opinions about commuting condition**

18 What do you think about your commuting condition (safety, comfort)?
☐ No problem ☐ Problem ☐ Serious problem

19 What do you think about commuting condition of workers in other vehicles or factories? ☐ No problem ☐ Problem ☐ Serious problem

20 What do you think about the commuting condition between now and past few years ago? ☐ Same ☐ Better ☐ A lot better

21 What do you think about employer in help solving this problem?
☐ Nothing ☐ Little ☐ A lot

22 What do you think about authority in help solving this problem?
☐ Nothing ☐ Little ☐ A lot

23 Can public bus help solving this problem? ☐ Nothing ☐ Little ☐ A lot

24 Can bus or van help solving this problem? ☐ Nothing ☐ Little ☐ A lot

25 Can road improvement help solving this problem? ☐ Nothing ☐ Little ☐ A lot

26 Can layby at factory help solving this problem? ☐ Nothing ☐ Little ☐ A lot

27 What do you think about law of limit passengers on vehicle?
☐ Disagree ☐ Neutral ☐ Agree

28 What do you think about stricter enforcement of driving license?
☐ Disagree ☐ Neutral ☐ Agree

29 What do you think about stricter enforcement of vehicle's technical check?
☐ Disagree ☐ Neutral ☐ Agree

30 What do you think about stricter drink-driving?
☐ Disagree ☐ Neutral ☐ Agree

31 What is the maximum additional amount of money you can pay for improving current commuting condition (seat, reducing crowded, safer vehicle, etc.)? _____$/month

Thank you for your participation!

Chulalongkorn University and AUN/SEED-Net JICA
Faculty of Engineering
Civil Engineering Department

Survey questionnaire of commuting of garment and footwear workers in Phnom Penh

_____General drivers_____

❖ **Opinions about commuting condition**

1 What do you think about commuting condition of garment and footwear workers (safety, comfort)? ☐ No problem ☐ Problem ☐ Serious problem
2 What do you think about the commuting condition between now and past few years ago? ☐ Same ☐ Better ☐ A lot better
3 How do you feel about the number of passengers?
☐ Uncrowded ☐ Acceptable ☐ Crowded
4 What do you think about their driving speed?
☐ Acceptable ☐ Fast ☐ Very fast
5 What do you think about their driving performance (overtaking, traffic violation, etc.)? ☐ Acceptable ☐ Bad ☐ Very bad
6 What do you think about their parking during loading and unloading passengers? ☐ Acceptable ☐ Bad ☐ Very bad
7 Can public bus help solving this problem? ☐ Nothing ☐ Little ☐ A lot
8 Can bus or van help solving this problem? ☐ Nothing ☐ Little ☐ A lot
9 Can road improvement help solving this problem? ☐ Nothing ☐ Little ☐ A lot
10 Can layby at factory help solving this problem? ☐ Nothing ☐ Little ☐ A lot
11 What do you think about law of limit passengers on vehicle?
☐ Disagree ☐ Neutral ☐ Agree
12 What do you think about stricter enforcement of driving license?
☐ Disagree ☐ Neutral ☐ Agree
13 What do you think about stricter enforcement of vehicle's technical check?
☐ Disagree ☐ Neutral ☐ Agree
14 What do you think about stricter drink-driving?
☐ Disagree ☐ Neutral ☐ Agree

Thank you for your participation!

Chulalongkorn University and AUN/SEED-Net JICA
Faculty of Engineering
Civil Engineering Department

Survey questionnaire of commuting of garment and footwear workers in Phnom Penh

_____Representatives from factories and labor union_____

1 How many workers (members) in your factory (union)? _____person
2 What is the range of working hour per day in your factory (of your members)? _____hour/day
3 What is the range of workers' salary in your factory (of your members)? _____$/month
4 What is the percentage of workers across commuting mode?
Private mode (walking, motorcycle, bicycle) _____%
Public bus _____%
5 What is the commuting benefits that your factory provide to workers?
☐ Free commuting and _____$/month
6 Why does your factory provide (not provide) vehicle to transport workers?
_____
_____

7 Are there any suggestions from workers about commuting?
_____
_____

8 How many workers has involved in in commuting accident since Jan 1st 2016?
Dead: _____, Serious Injured: _____, Slight injured: _____
9 Who is responsible for these accidents? _____
10 What is the turnover rate of your factory? _____
11 What are the reasons behind this turnover? _____
12 What is your plan to improve the commuting condition of workers?
_____
_____

Thank for your participation!

សកលវិទ្យាល័យជុលាឡុងកន ឆីង AUN/SEED-Net JICA
មហាវិទ្យាល័យវិស្វកម្ម
ដេប៉ាតឺម៉ង់សំណង់ស៊ីវិល

ការសិក្សាពីការធ្វើដំណើរបស់កម្មរោងចក្រកាត់ដេរនៅទីក្រុងភ្នំពេញ

_____សំណួរសម្រាប់អ្នកបើកបររថយន្តដឹកកម្មករ_____

❖ ពត៌មានផ្ទាល់ខ្លួន

1. តើអ្នកមានអាយុប៉ុន្មាន? _____ឆ្នាំ
2. តើអ្នកមាន ប្រាក់ចំណូលសរុបប្រចាំខែប៉ុន្មាន? ☐តិចជាង$200 ☐$201-$300 ☐$301-$400 ☐$401-$500 ☐$501-$600 ☐$601-$700 ☐$701-$800 ☐$801-$900 ☐ច្រើនជាង$900

❖ ពត៌មានទាក់ទងនឹងការបើកបរ

3. តើអ្នកចេះបើកបរ ប៉ុន្មានឆ្នាំហើយ? _____ឆ្នាំ
4. តើប័ណ្ណបើកបររបស់អ្នក ជាប្រភេទអ្វី? ☐ក១ ☐ក២ ☐ខ ☐គ ☐ឃ១ ☐ឃ២ ☐ង
5. តើរថយន្តដែលអ្នកបើកបរ ជាប្រភេទអ្វី? ☐ម៉ូតូរ៉ឺម៉ក ☐ទូរីស ☐រថយន្តក្រុង ☐រថយន្តទ្រុងតូច (ប្រភេទ1-1,5តោន) ☐រថយន្តទ្រុងមធ្យម (ប្រភេទ2-2,5តោន)
6. តើអ្នកបើកបររថយន្តផ្ទាល់ខ្លួន? ☐ផ្ទាល់ខ្លួន ☐ផ្សេងៗ
7. តើអ្នកទទួលថ្លៃដឹកកម្មករពីរោងចក្រ? ☐រោងចក្រ ☐ផ្សេងៗ
8. តើរថយន្តដែលអ្នក មានប័ណ្ណត្រួតពិនិត្យបច្ចេកទេសរថយន្ត(ឆៀករថយន្ត) ដែរឬទេ? ☐មាន ☐មិនមាន
9. តើរថយន្តរបស់អ្នក មានអ្នកជិះជាមធ្យមប៉ុន្មាននាក់? _____នាក់
10. តើរថយន្តរបស់អ្នក មានផ្តល់កន្លែងអង្គុយសមរម្យដែរឬទេ? ☐មាន ☐មិនមាន
11. តើអ្នកបើកបរ ចំងាយប៉ុន្មានគីឡូមែត្រ? _____គីឡូមែត្រ
12. តើអ្នកបើកបរ ចំណាយពេលប៉ុន្មាននាទី? _____នាទី
13. តើអ្នក យកថ្លៃធ្វើដំណើរ ប៉ុន្មានពីកម្មករម្នាក់ក្នុងមួយខែ?_____ដុល្លា/ខែ
14. តើអ្នកទទួលទានគ្រឿងស្រវឹង មុនពេលបើកបរញឹកញាប់ប៉ុណ្ណា? ☐មិនដែលសោះ ☐ម្តង-ពីរដង/ឆ្នាំ ☐ម្តង-ពីរដង/ខែ ☐ម្តង-ពីរដង/សប្តាហ៍ ☐រាល់ថ្ងៃ
15. តើអ្នកត្រូវបានប៉ូលីសចរាចរណ៍បញ្ឈប់ ពេលកំពង់បើកបររថយន្ត ដើម្បីត្រួតពិនិត្យ ញឹកញាប់ប៉ុណ្ណា? ☐មិនដែលសោះ ☐ម្តង-ពីរដង/ឆ្នាំ ☐ម្តង-ពីរដង/ខែ ☐ម្តង-ពីរដង/សប្តាហ៍ ☐រាល់ថ្ងៃ
16. តើអ្នកធ្លាប់ជួបគ្រោះថ្នាក់ចរាចរណ៍ ក្នុងរយៈពេល១២ខែចុងក្រោយនេះដែរឬទេ? ☐ធ្លាប់ ☐មិនធ្លាប់

❖ មតិយោបល់ទាក់ទងនឹកការធ្វើដំណើរ

17. តើអ្នកគិតថា ការធ្វើដំណើររបស់កម្មករ តាមរថយន្តរបស់អ្នកជាបញ្ហាដែរឬទេ(សុវត្ថិភាព, ជាសុកភាព)?
☐ មិនជាបញ្ហាទេ ☐ ជាបញ្ហាប្រឈមតិចតួច ☐ ជាបញ្ហាប្រឈមខ្លាំង

18. តើអ្នកយល់ថា ការធ្វើដំណើរនាពេលបច្ចុប្បន្ន របស់កម្មកររបស់រោងចក្រផ្សេងៗ ជាបញ្ហាដែរឬទេ?
☐ មិនជាបញ្ហាទេ ☐ ជាបញ្ហាប្រឈមតិចតួច ☐ ជាបញ្ហាប្រឈមខ្លាំង

19. តើអ្នកយល់ថា ការធ្វើដំណើរនាពេលបច្ចុប្បន្នរបស់នាក់ ប្រសើរជាង២-៣ឆ្នាំមុនរឺទេ?
☐ ដូចតែមុន ☐ ប្រសើរជាងមុនតិចតួច ☐ ប្រសើរជាងមុនច្រើន

20. តើភាគីរោងចក្រ បានចូលរួមដោះស្រាយបញ្ហានេះដល់កំរិតណា?
☐ មិនបានជួយសោះ ☐ ចូលរួមជួយបានតិចតួច ☐ ចូលរួមជួយបានច្រើន

21. តើភាគីរដ្ឋាភិបាល បានចូលរួមដោះស្រាយបញ្ហានេះដល់កំរិតណា?
☐ មិនបានជួយសោះ ☐ ចូលរួមជួយបានតិចតួច ☐ ចូលរួមជួយបានច្រើន

22. តើការផ្តល់រថយន្តដឹកជញ្ជូនសាធារណៈ(រថយន្តក្រុងរាជធានីភ្នំពេញ) ជួយដោះស្រាយបញ្ហានេះដែរឬទេ?
☐ មិនអាចជួយអ្វីបានទេ ☐ អាចជួយបានតិចតួច ☐ អាចជួយបានច្រើន

23. តើអ្នកគិតថា ការប្តូរប្រភេទរថយន្តដឹកកម្មករបច្ចុប្បន្ន ទៅប្រើប្រាស់ប្រភេទរថយន្តទូរ៉ឺស ឬរថយន្តក្រុងដែលមានលក្ខណៈបច្ចេកទេសត្រឹមត្រូវ អាចជួយដោះស្រាយបញ្ហាបានដែរឬទេ?
☐ មិនអាចជួយអ្វីបានទេ ☐ អាចជួយបានតិចតួច ☐ អាចជួយបានច្រើន

24. តើអ្នកគិតថា ការជួសជុលនឹងកែលំអផ្លូវថ្នល់ អាចជួយអោយ ស្ថានភាពធ្វើដំណើរប្រសើរឡើងដែរឬទេ?
☐ មិនអាចជួយអ្វីបានទេ ☐ អាចជួយបានតិចតួច ☐ អាចជួយបានច្រើន

25. តើអ្នកគិតថា ការពង្រីកចិញ្ចើមផ្លូវនៅមុខរោងចក្រ ដើម្បីផ្តល់ភាពងាយស្រួល ក្នុងការចតរថយន្ត នឹងការឡើងចុះរបស់កម្មករ អាចជួយអោយស្ថានភាពធ្វើដំណើរប្រសើរឡើងដែរឬទេ?
☐ មិនអាចជួយអ្វីបានទេ ☐ អាចជួយបានតិចតួច ☐ អាចជួយបានច្រើន

26. តើអ្នកចង់អោយមាន ច្បាប់កំណត់ចំនួនអ្នកជិះលើរថយន្តដែរឬទេ?
☐ មិនចង់អោយមានទេ ☐ មានក៏បាន-អត់ក៏បាន ☐ ចង់អោយមាន

27. តើអ្នកចង់អោយមាន ការពង្រឹងច្បាប់ប័ណ្ណបើកបរដែរឬទេ?
☐ មិនចង់អោយពង្រឹងទេ ☐ ពង្រឹងក៏បាន-មិនពង្រឹងក៏បាន ☐ ចង់អោយពង្រឹង

28. តើអ្នកចង់អោយមាន ការពង្រឹងច្បាប់ត្រួតពិនិត្យបច្ចេកទេសរថយន្ត(ឆៀករថយន្ត)ដែរឬទេ?
☐ មិនចង់អោយពង្រឹងទេ ☐ ពង្រឹងក៏បាន-មិនពង្រឹងក៏បាន ☐ ចង់អោយពង្រឹង

29. តើអ្នកចង់អោយមាន ការពង្រឹងច្បាប់បើកបរក្នុងពេលស្រវឹងដែរឬទេ?
☐ មិនចង់អោយពង្រឹងទេ ☐ ពង្រឹងក៏បាន-មិនពង្រឹងក៏បាន ☐ ចង់អោយពង្រឹង

30. ប្រសិនបើអ្នក ត្រូវកំរិតអោយផ្តល់កន្លែងអង្គុយអោយបានត្រឹមត្រូវ កំរិតចំនួនអ្នកជិះ នឹងត្រួតពិនិត្យរថយន្តជាប្រចាំ(ឆៀករថយន្ត), តើអ្នក នឹងយកថ្លៃឈ្នួលជិះបន្ថែមប៉ុន្មានពីកម្មករ?_____ដុល្លា/ខែ

សូមអរគុណសម្រាប់ការចូលរួម!

សកលវិទ្យាល័យចុលាឡុងកន នឹង AUN/SEED-Net JICA

មហាវិទ្យាល័យវិស្វកម្ម

ដេប៉ាតឺម៉ង់សំណង់ស៊ីវិល

ការសិក្សាពីការធ្វើដំណើររបស់កម្មរោងចក្រកាត់ដេរនៅទីក្រុងភ្នំពេញ

_____សំណួរសម្រាប់កម្មកររោងចក្រកាត់ដេរ_____

❖ ពត៌មានផ្ទាល់ខ្លួន

1. តើអ្នកមានអាយុប៉ុន្មាន? _____ឆ្នាំ
2. តើអ្នកមាន ប្រាក់ចំណូលសរុបប្រចាំខែប៉ុន្មាន? ☐តិចជាង$150 ☐$151-$170 ☐$171-$190 ☐$191-$210 ☐$211-$230 ☐$231-$250 ☐$251-$270 ☐$271-$300 ☐ច្រើនជាង$300

❖ ពត៌មានទាក់ទងនឹងការធ្វើដំណើរ

3. តើរថយន្តដែលអ្នកបើកបរ ជាប្រភេទអ្វី? ☐ម៉ូតូរ៉ឺម៉ក ☐ទូរីស ☐រថយន្តក្រុង ☐រថយន្តទ្រុងតូច (ប្រភេទ1-1,5តោន) ☐រថយន្តទ្រុងមធ្យម (ប្រភេទ2-2,5តោន)
4. តើអ្នកចំណាយប៉ុន្មាន ក្នុងការធ្វើដំណើរក្នុងមួយខែ(សូន្យករណីរថយន្តរោងចក្រ)? _____ដុល្លា/ខែ
5. តើអ្នកចំណាយពេលប៉ុន្មាននាទី ក្នុងការធ្វើដំណើរ ពីផ្ទះទៅរោងចក្រក្នុងមួយជើង? _____នាទី
6. តើចំងាយពីផ្ទះរបស់នាក់ ទៅរោងចក្រមានចំងាយប្រហែលប៉ុន្មានគីឡូមែត្រ?_____គីឡូមែត្រ
7. តើរថយន្តដែលអ្នកជិះ មានផ្តល់កន្លែងអង្គុយសមរម្យដែរឬទេ? ☐មាន ☐មិនមាន
8. តើនៅលើរថយន្តដែលអ្នកជិះ មានអ្នករួមដំណើរប្រហែលប៉ុន្មាននាក់?_____នាក់
9. តើអ្នកមានអារម្មណ៍យ៉ាងណា ចំពោះចំនួនអ្នកជិះនៅលើរថយន្ត?
   ☐ ទូលាយ ☐ ល្មម ☐ ចង្អៀត
10. តើអ្នក យល់យ៉ាងណា ចំពោះស្ថានភាពផ្លូវ?
   ☐ ផ្លូវល្អច្រើន ☐ ល្អខ្លះ-មិនល្អខ្លះ ☐ ផ្លូវមិនល្អច្រើន
11. តើអ្នកយល់យ៉ាងណា ចំពោះយានយន្តដែលអ្នកជិះ? ☐ ថ្មី ☐ ល្មម ☐ ចាស់គ្រាន់ដែរ
12. តើអ្នកយល់យ៉ាងណា ចំពោះល្បឿនរបស់រថយន្តដែលអ្នកជិះ? ☐ ល្មម ☐ លឿនបន្តិច ☐ លឿនខ្លាំង
13. តើអ្នកយល់យ៉ាងណា ចំពោះការបើកបរ(គោរព្ធច្បាប់, ការ៉ាជែង) របស់អ្នកបើកបររថយន្ត ដែលអ្នកជិះ?
   ☐ ល្អ ☐ មិនសូវល្អដែរ ☐ មិនល្អខ្លាំង
14. តើអ្នកធ្លាប់ជួបបញ្ហារថយន្ត(កង់, ចង្កូត, ហ្វ្រាំង) ក្នុងរយៈពេល១២ខែចុងក្រោយនេះដែរឬទេ?
   ☐ធ្លាប់ ☐មិនធ្លាប់
15. តើអ្នកធ្លាប់ជួបគ្រោះថ្នាក់ចរាចរណ៍ ក្នុងរយៈពេល១២ខែចុងក្រោយនេះដែរឬទេ? ☐ធ្លាប់ ☐មិនធ្លាប់
16. តើអ្នកយល់យ៉ាងណា ចំពោះសុវត្ថិភាពក្នុងការធ្វើដំណើរ? ☐ មិនបារម្ភទេ ☐ បារម្ភតិចតួច ☐ បារម្ភខ្លាំង
17. តើអ្នកយល់យ៉ាងណា ចំពោះការធ្វើដំណើររបស់អ្នកនាពេលបច្ចុប្បន្ន?
   ☐ មិនពេញចិត្ត ☐ ធម្មតា ☐ ពេញចិត្ត

❖ មតិយោបល់ទាក់ទងនឹកការធ្វើដំណើរ

18. តើអ្នកយល់ថា ការធ្វើដំណើរនាពេលបច្ចុប្បន្ន របស់នាក់ ជាបញ្ហាដែរឬទេ(សុវត្ថិភាព, ជាសុកភាព)?
☐ មិនជាបញ្ហាទេ ☐ ជាបញ្ហាប្រឈមតិចតួច ☐ ជាបញ្ហាប្រឈមខ្លាំង

19. តើអ្នកយល់ថា ការធ្វើដំណើរនាពេលបច្ចុប្បន្ន របស់កម្មកររបស់រោងចក្រផ្សេងៗ ជាបញ្ហាដែរឬទេ?
☐ មិនជាបញ្ហាទេ ☐ ជាបញ្ហាប្រឈមតិចតួច ☐ ជាបញ្ហាប្រឈមខ្លាំង

20. តើអ្នកយល់ថា ការធ្វើដំណើរនាពេលបច្ចុប្បន្នរបស់នាក់ ប្រសើរជាង២-៣ឆ្នាំមុនរឺទេ?
☐ ដូចតែមុន ☐ ប្រសើរជាងមុនតិចតួច ☐ ប្រសើរជាងមុនច្រើន

21. តើភាគីរោងចក្រ បានចូលរួមដោះស្រាយបញ្ហានេះដល់កំរិតណា?
☐ មិនបានជួយសោះ ☐ ចូលរួមជួយបានតិចតួច ☐ ចូលរួមជួយបានច្រើន

22. តើភាគីរដ្ឋាភិបាល បានចូលរួមដោះស្រាយបញ្ហានេះដល់កំរិតណា?
☐ មិនបានជួយសោះ ☐ ចូលរួមជួយបានតិចតួច ☐ ចូលរួមជួយបានច្រើន

23. តើការផ្តល់រថយន្តដឹកជញ្ជូនសាធារណៈ(ដូចរថយន្តក្រុងរាជធានីភ្នំពេញ) ជួយដោះស្រាយបញ្ហានេះដែរឬទេ? ☐ មិនអាចជួយអ្វីបានទេ ☐ អាចជួយបានតិចតួច ☐ អាចជួយបានច្រើន

24. តើអ្នកគិតថា ការប្តូរប្រភេទរថយន្តដឹកកម្មករបច្ចុប្បន្ន ទៅប្រើប្រាស់ប្រភេទរថយន្តទូរ៉ឺស ឬរថយន្តក្រុងដែលមានលក្ខណៈបច្ចេកទេសត្រឹមត្រូវ អាចជួយដោះស្រាយបញ្ហាបានដែរឬទេ?
☐ មិនអាចជួយអ្វីបានទេ ☐ អាចជួយបានតិចតួច ☐ អាចជួយបានច្រើន

25. តើអ្នកគិតថា ការជួសជុលនឹងកែលំអផ្លូវថ្នល់ អាចជួយអោយ ស្ថានភាពធ្វើដំណើរប្រសើរឡើងដែរឬទេ?
☐ មិនអាចជួយអ្វីបានទេ ☐ អាចជួយបានតិចតួច ☐ អាចជួយបានច្រើន

26. តើអ្នកគិតថា ការពង្រីកចិញ្ចើមផ្លូវនៅមុខរោងចក្រ ដើម្បីផ្តល់ភាពងាយស្រួល ក្នុងការចតរថយន្ត នឹងការឡើងចុះរបស់កម្មករ អាចជួយអោយស្ថានភាពធ្វើដំណើរប្រសើរឡើងដែរឬទេ?
☐ មិនអាចជួយអ្វីបានទេ ☐ អាចជួយបានតិចតួច ☐ អាចជួយបានច្រើន

27. តើអ្នកចង់អោយមាន ច្បាប់កំណត់ចំនួនអ្នកជិះលើរថយន្តដែរឬទេ?
☐ មិនចង់អោយមានទេ ☐ មានក៏បាន-អត់ក៏បាន ☐ ចង់អោយមាន

28. តើអ្នកចង់អោយមាន ការពង្រឹងច្បាប់ប័ណ្ណបើកបរដែរឬទេ?
☐ មិនចង់អោយពង្រឹងទេ ☐ ពង្រឹងក៏បាន-មិនពង្រឹងក៏បាន ☐ ចង់អោយពង្រឹង

29. តើអ្នកចង់អោយមាន ការពង្រឹងច្បាប់ត្រួតពិនិត្យបច្ចេកទេសរថយន្ត(ឆៀករថយន្ត)ដែរឬទេ?
☐ មិនចង់អោយពង្រឹងទេ ☐ ពង្រឹងក៏បាន-មិនពង្រឹងក៏បាន ☐ ចង់អោយពង្រឹង

30. តើអ្នកចង់អោយមាន ការពង្រឹងច្បាប់បើកបរក្នុងពេលស្រវឹងដែរឬទេ?
☐ មិនចង់អោយពង្រឹងទេ ☐ ពង្រឹងក៏បាន-មិនពង្រឹងក៏បាន ☐ ចង់អោយពង្រឹង

31. ប្រសិនបើរថយន្តដែលអ្នកជិះ បានផ្តល់កន្លែងអង្គុយត្រឹមត្រូវ(រថយន្តមានដំបូល) កំរិតចំនួនអ្នកជិះ នឹងត្រួតពិនិត្យរថយន្តជាប្រចាំ(ឆៀករថយន្ត), តើអ្នក ហ៊ានចំណាយថ្លៃឈ្នួលរថយន្តបន្ថែមប៉ុន្មាន បន្ថែមលើថ្លៃឈ្នួលរថយន្តបច្ចុប្បន្ន? _____ដុល្លា/ខែ

សូមអរគុណសម្រាប់ការចូលរួម!

សកលវិទ្យាល័យជុលាឡុងកន នឹង AUN/SEED-Net JICA

មហាវិទ្យាល័យវិស្វកម្ម

ដេប៉ាតឺម៉ង់សំណង់ស៊ីវិល

ការសិក្សាពីការធ្វើដំណើរបស់កម្មរោងចក្រកាត់ដេរនៅទីក្រុងភ្នំពេញ

_____សំណួរសម្រាប់អ្នកបើកបររថយន្តទូទៅ_____

1. តើអ្នកយល់ថា ការធ្វើដំណើរនាពេលបច្ចុប្បន្ន របស់កម្មកររបស់រោងចក្រ ជាបញ្ហាដែរឬទេ?
   ☐ មិនជាបញ្ហាទេ ☐ ជាបញ្ហាប្រឈមតិចតួច ☐ ជាបញ្ហាប្រឈមខ្លាំង
2. តើអ្នកយល់ថា ការធ្វើដំណើរនាពេលបច្ចុប្បន្នរបស់កម្មកររបស់រោងចក្រ ប្រសើរជាង២-៣ឆ្នាំមុនឬទេ?
   ☐ ដូចតែមុន ☐ ប្រសើរជាងមុនតិចតួច ☐ ប្រសើរជាងមុនច្រើន
3. តើអ្នកយល់យ៉ាងណា ចំពោះចំនួនមនុស្សលើរថយន្តដឹកកម្មករ?
   ☐ ល្មម ☐ ច្រើនដែរ ☐ ច្រើនខ្លាំង
4. តើអ្នកយល់យ៉ាងណា ចំពោះល្បឿនរបស់រថយន្តដឹកកម្មករ?
   ☐ ល្មម ☐ លឿនដែរ ☐ លឿនខ្លាំង
5. តើអ្នកយល់យ៉ាងណា ចំពោះការបើកបរ(គោរពច្បាប់, ការវ៉ាជែង) របស់អ្នកបើកបររថយន្តដឹកកម្មករ?
   ☐ ល្មម ☐ មិនសូវល្អប៉ុន្មានទេ ☐ មិនល្អខ្លាំង
6. តើអ្នកយល់យ៉ាងណា ចំពោះការចតដើម្បីដាក់ ឬរងចាំកម្មករ របស់អ្នកបើកបររថយន្តដឹកកម្មករ?
   ☐ មានតិចតួចចតមិនត្រឹមត្រូវ ☐ ប្រហែលពាក់កណ្តាលចតមិនត្រឹមត្រូវ ☐ ភាគច្រើនចតមិនត្រឹមត្រូវ
7. តើការផ្តល់រថយន្តដឹកជញ្ជូនសាធារណៈ(រថយន្តក្រុងរាជធានីភ្នំពេញ) ជួយដោះស្រាយបញ្ហានេះដែរឬទេ?
   ☐ មិនអាចជួយអ្វីបានទេ ☐ អាចជួយបានតិចតួច ☐ អាចជួយបានច្រើន
8. តើអ្នកគិតថា ការប្តូរប្រភេទរថយន្តដឹកកម្មកររបច្ចុប្បន្ន ទៅប្រើប្រាស់ប្រភេទរថយន្តទូរ៉ឺស ឬរថយន្តក្រុងដែលមានលក្ខណៈបច្ចេកទេសត្រឹមត្រូវ អាចជួយដោះស្រាយបញ្ហាបានដែរឬទេ?
   ☐ មិនអាចជួយអ្វីបានទេ ☐ អាចជួយបានតិចតួច ☐ អាចជួយបានច្រើន
9. តើអ្នកគិតថា ការជួសជុលនឹងកែលំអផ្លូវថ្នល់ អាចជួយអោយ ស្ថានភាពធ្វើដំណើរប្រសើរឡើងដែរឬទេ?
   ☐ មិនអាចជួយអ្វីបានទេ ☐ អាចជួយបានតិចតួច ☐ អាចជួយបានច្រើន
10. តើអ្នកគិតថា ការពង្រីកចិញ្ចើមផ្លូវនៅមុខរោងចក្រ ដើម្បីផ្តល់ភាពងាយស្រួល ក្នុងការចតរថយន្ត នឹងការឡើងចុះរបស់កម្មករ អាចជួយអោយស្ថានភាពធ្វើដំណើរប្រសើរឡើងដែរឬទេ?
    ☐ មិនអាចជួយអ្វីបានទេ ☐ អាចជួយបានតិចតួច ☐ អាចជួយបានច្រើន
11. តើអ្នកចង់អោយមាន ច្បាប់កំណត់ចំនួនអ្នកជិះលើរថយន្តដែរឬទេ?
    ☐ មិនចង់អោយមានទេ ☐ មានក៏បាន-អត់ក៏បាន ☐ ចង់អោយមាន
12. តើអ្នកចង់អោយមាន ការពង្រឹងច្បាប់ប័ណ្ណបើកបរដែរឬទេ?
    ☐ មិនចង់អោយពង្រឹងទេ ☐ ពង្រឹងក៏បាន-មិនពង្រឹងក៏បាន ☐ ចង់អោយពង្រឹង
13. តើអ្នកចង់អោយមាន ការពង្រឹងច្បាប់ត្រួតពិនិត្យបច្ចេកទេសរថយន្ត(ឆៀករថយន្ត)ដែរឬទេ?
    ☐ មិនចង់អោយពង្រឹងទេ ☐ ពង្រឹងក៏បាន-មិនពង្រឹងក៏បាន ☐ ចង់អោយពង្រឹង
14. តើអ្នកចង់អោយមាន ការពង្រឹងច្បាប់បើកបរក្នុងពេលស្រវឹងដែរឬទេ?
    ☐ មិនចង់អោយពង្រឹងទេ ☐ ពង្រឹងក៏បាន-មិនពង្រឹងក៏បាន ☐ ចង់អោយពង្រឹង

សូមអរគុណសម្រាប់ការចូលរួម!

សកលវិទ្យាល័យជុលាឡុងកន នឹង AUN/SEED-Net JICA
មហាវិទ្យាល័យវិស្វកម្ម
ដេប៉ាតឺម៉ង់សំណង់ស៊ីវិល

ការសិក្សាពីការធ្វើដំណើររបស់កម្មរោងចក្រកាត់ដេរនៅទីក្រុងភ្នំពេញ

_____សំណួរសម្រាប់តំណាងពីរោងចក្រ ឬសហជីព_____

1 តើនៅក្នុងរោងចក្រ(សហជីព)របស់អ្នក មានកម្មករប៉ុន្មាននាក់? _____នាក់

2 តើកម្មកររនៅក្នុងរោងចក្រ(សហជីព)របស់អ្នក ធ្វើការប្រហែលប៉ុន្មានម៉ោង/ថ្ងៃ?_____ម៉ោង/ថ្ងៃ

3 តើកម្មកររនៅក្នុងរោងចក្រ(សហជីព)របស់អ្នក ទទួលបានប្រាក់ខែ ក្នុងចន្លោះប៉ុន្មានដុល្លា?_____$/ខែ

4 ភាគរយនៃកម្មកដែរធ្វើដំណើរ តាមប្រភេទនីមួយៗ៖

ថ្មាល់ខ្លួន(ដើរ កង់ ម៉ូតូ)_____ភាគរយ,

យានយន្តរួម_____ភាគរយ,

5 តើកម្មកររបស់អ្នក ទទួលបានអត្ថប្រយោជន៍លើមធ្យោបាយធ្វើដំណើរអ្វីខ្លះ?

☐ ផ្តល់រថយន្តសម្រាប់ដឹកជញ្ជូន ☐ _____ $/ខែ

6 ហេតុអ្វីបានជា រោងចក្ររបស់អ្នកផ្តល់ (មិនផ្តល់)រថយន្តសម្រាប់ដឹកជញ្ជូនកម្មករ?

_____,

_____ ,

7 តើកម្មកររនៅរោងចក្រ(សហជីព)របស់អ្នក ធ្លាប់ធ្វើការស្នើរសុំអ្វីខ្លះទាក់ទងនឹងការធ្វើដំណើរ?

_____,

_____ ,

8 តើមានកម្មករប៉ុន្មាននាក់ ដែលជួបនឹងបញ្ហាគ្រោះថ្នាក់ចរាចរណ៍ ចាប់តាំងពីថ្ងៃទី១មករាមក?

ស្លាប់_____ ,រងរបួសធ្ងន់_____ ,រងរបួសស្រាល_____ ,

9 តើអ្នកណា ជាអ្នកទទួលខុសត្រូវលើបញ្ហានេះ?

_____ ,

_____ ,

10 តើមានកម្មកប្រហែលប៉ុន្មាននាក់ ដែលបានសុំឈប់ពីការងារក្នុងខែៗ?_____នាក់

11 មូលហេតុអ្វី?

_____ ,

_____ ,

12 តើអ្នកមានសំណើរឹតម្រោងអ្វីខ្លះ ដើម្បីធ្វើអោយ ការធ្វើដំណើររបស់កម្មកររបស់អ្នក មានលក្ខណៈល្អប្រសើរថែមទៀត?

_____ ,

សូមអរគុណសម្រាប់ការចូលរួម!

VITA

Narith Saum is transportation engineer who graduated from Chulalongkorn University, Thailand. He was born in 1992 in Banteay Mean Chey Province, Cambodia. Narith earned his high school diploma in 2010 from Hun Sen Mongkol Borey high school, which located in his hometown. In the same year, he moved to Phnom Penh for his bachelor degree at Institute of Technology of Cambodia. in 2012 while he was in his third year, Narith chose civil engineering major, and graduated in July 2015. He was quite transportation issues, and fortunately he was awarded AUN/SEED-Net scholarship supported by Japanese government to pursue his master degree in Thailand specializing in transportation engineering. His research mainly focused on transportation safety of an informal transportation system in Phnom Penh. Narith planned to get into professional work for few years before extending his research in another degree, and then returning back to his home country for a public-sector work.