YANGON UNIVERSITY OF ECONOMICS

MASTER OF PUBLIC ADMINISTRATION PROGRAMME

ROAD SAFETY AWARENESS AND DRIVERS' BEHAVIOUR

(CASE STUDY: YANGON – MANDALAY EXPRESSWAY)

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A thesis submitted as a partial fulfillment towards the requirements for the degree of Master of Public Administration

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ABSTRACT

Yangon - Mandalay expressway has opened and started operating since 2010 and it is mainly linked with Yangon, Nay Pyi Taw and Mandalay. Since then, there are so many negative impacts of that highway such as severe accidents and crashes which are happening nearly every day. According to the data from highway police, during 2012 - 2018, 77% of the accidents among 3000 cases are caused due to human errors. It is found out the basic main 4 factors of traffic accidents; driver's error, vehicle malfunction, road and weather conditions. Among them, human error is the most important and frequent fact which is likely to lead to occur accidents. Therefore, the experience, awareness and behaviour of drivers are the fundamental and necessary things to prevent and reduce traffic accidents. This survey is designed to examine the factors that affect on road traffic accidents and explore the drivers' behaviour and awareness based on their age, education level and type of car they drive, in order to reduce the rate of accidents remarkably. Based on the findings and survey result of this thesis, the central government and the respective organizations and institutions should implement more to be stronger and more perfect expressways which can bring in the wellbeing and sustainable benefits of Myanmar citizens. The government authorities also should review more strict regulation regarding the drivers' behaviour and improve the conditions of police force, law enforcement of road accidents.

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LIST OF ABBREVIATIONS

ADB	-	Asian Development Bank
AIDS	-	Acquired Immune Deficiency Syndrome
ARRSS	-	ASEAN Regional Road Safety Strategy
ASEAN	-	Association of Southeast Asia Nations
GDP	-	Gross Domestic Product
GRSP	-	Global Road Safety Partnership
GSR	-	Global Status Report
HIV	-	Human Immunodeficiency Virus
IFRC	-	International Federation of Red Cross
IRCRCM	-	International Red Cross and Red Crescent Movement
MMK	-	Myanmar Kyat
MOTC	-	Ministry of Transportation and Communication
MRSAP	-	Myanmar Road Safety Action Plan
NRSC	-	National Road Safety Council
RSG	-	Road Safety Group
RSM	-	Road Safety Maturity
RTA	-	Road Traffic Accident
RTAD	-	Road Transport Authority Department
SUV	-	Sport Utility Vehicle
TRESC	-	Traffic Rule Enforcement Supervisory Committee
UK	-	United Kingdom
UN	-	United Nations
UNRSC	-	United Nations Road Safety Council
WHO	-	World Health Organization
YBS	-	Yangon Bus System
YRTA	-	Yangon Region Transport Authority

CHAPTER I
INTRODUCTION

1.1 Rationale of the Study

Road transport safety is an important issue in the land transport sector. It can be even regarded as the lifeblood of a country. Road transport can enable passengers to move from their place of origin to the desired destinations and it also establishes easy contact between farms, fields, factories and markets and provides door to door service. In another word, the good road transportation system can secure the life and housing of citizens, make the quick flow of goods and services, arise the new markets.

The primary purpose of highway transportation is to provide efficient facilities without delaying time for nation. The goal of highway transportation system is to move goods and passengers efficiently with least negative impacts. Besides creating enormous social and economic benefits for citizens, people and communities, considerable accidents and injuries on highway road place a heavy burden for government. Poor road transportation can affect considerable economic losses to victims, their families and to nation as a whole. Therefore, both the good and bad facts of road transportation has a big impact not only on one citizen but also on the whole country.

Before 2010, there were 3 main highways in Myanmar. They are the connect way of Upper and Lower Myanmar, running from South to North, namely Yangon – Mandalay highway, Yangon - Pyay and Pathein - Monywa highway. The most strategic new highway called as Expressway has opened since 2010 which provides many benefits to highway sector of Myanmar. As a fruitful result of this Yangon - Mandalay expressway, it save time and money, also make the drivers and passengers more comfortable and the quick flow of goods and services than ever before. However, on the other hand, it is the main factor of unnecessary and horrible accidents are being happened ceaselessly. Due to the technical requirements and low budget usage, the new expressway is befallen as an unqualified highway and need a lot of requirement to be added and fixed.

Comparing to the accidents on expressway, they are both because of the deficiency of road infrastructure and just because of the careless of the road users. The lack of driver awareness and poor driving behaviour on following the traffic rules has played a large percentage in total accident cases. In accordance with the documents and record from highway police, 77% of the accidents were occurred due to the fault of driver from 2012 to 2018. Consequently, the driver awareness and driver behaviour is in the major part of eliminating accident cases and be safe. Therefore, this research is dedicated to observe the driver awareness and driver behaviour in order to reduce the accident rate on expressway.

1.2 Objectives of the Study

The objectives of the study are:

(i) To explore the factors that affect on road traffic accidents.

(ii) To examine awareness and behaviour of drivers on road safety.

1.3 Method of Study

This study uses descriptive method based on both primary and secondary data sources and information. Primary data is collected by interviewing the key persons. Conduct survey to highway bus drivers and private car drivers with structured questionnaires. Sample size is 200 respondents and obtained by using systematic sampling method. The required secondary data for this thesis is collected from the Highway Police Office of Yangon – Mandalay Expressway.

1.4 Scope and Limitations of the Study

This study focuses on the highway bus and private car drivers who drive on Yangon – Mandalay Expressway by using cross sectional survey. The survey is undertaken to 200 drivers at 39^{th} mile and 115^{th} mile rest camp terminals. The survey questionnaire data were collected on second weekend of February, 2019. This study examines the awareness and behaviour of drivers who drive on expressway.

1.5 Organization of the Study

This thesis is composed of five chapters. Chapter (I) is the introduction. It presents the objective of the study, method of study, the scope and limitation of the study and the organization of the study. Global road safety awareness and road traffic preventative strategies are presents in Chapter (II). Chapter (III) describes the organizations related for road traffic safety in Myanmar, highway transport condition and road safety and traffic accidents on Yangon - Mandalay Expressway. Chapter (IV) is analysis of the road safety awareness and behaviour of drivers who drive on Yangon - Mandalay Expressway. This study concludes with findings and recommendations in Chapter (V).

CHAPTER II
LITERATURE REVIEW

2.1 Road Traffic Safety

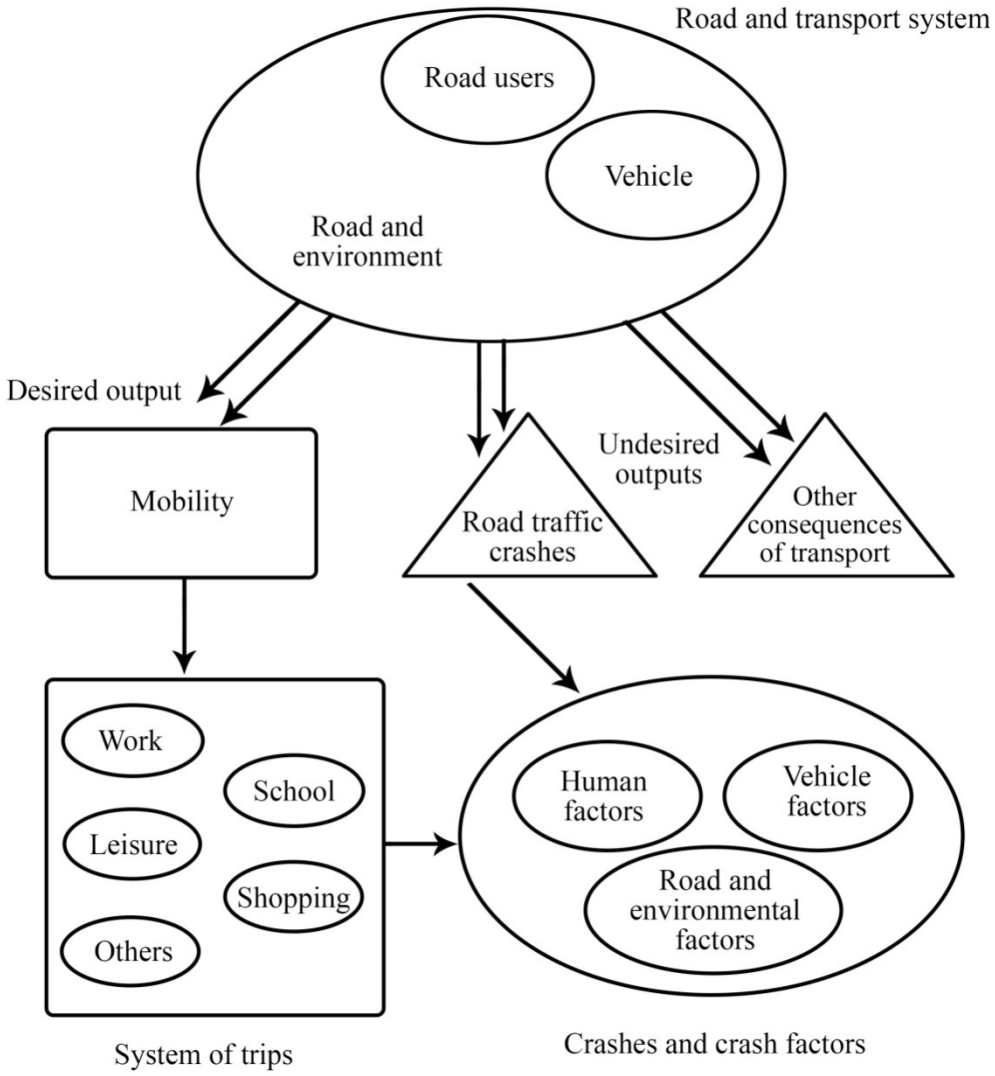
Road traffic safety refers to methods and measures for reducing the risk of a person using the road network being killed or seriously injured. The users of a road include pedestrians, cyclists, motorists, their passengers, and passengers of on-road public transport, mainly buses and trams. Best-practice road safety strategies focus upon the prevention of serious injury and death crashes in spite of human fallibility. Safe road design is now about providing a road environment which ensures vehicle speeds will be within the human tolerances for serious injury and death wherever conflict points exist. Furthermore, the highest possible degree of safety shall be ensured when transporting goods by road. It is vital importance to monitor and validate the road transportation safety, including comprehensive checks on drivers, vehicles and safety processes. The basic strategy of a safe system approach is to ensure that in the event of a crash, the impact energies remain below the threshold likely to produce either death or serious injury. This intensity will vary depending upon the level of protection offered to the road users involved (Wikipedia).

Road safety is primarily meant about the protection and security of all those who travel on roads. It encapsulates all from pedestrians to animal-drawn vehicles and from two-wheelers to all types of multi-wheel transport. It is a double-sided and complementary exercise and will bear less fruit if it is minus anyone; that is to say, everybody will have to honour other's rights to see his ones respected (Faisal Faraz, 2011).

As sustainable solutions for all classes of road safety have not been identified, particularly low-traffic rural and remote roads, a hierarchy of control should be applied, similar to classifications used to improve occupational safety and health. At the highest level is sustainable prevention of serious injury and death crashes, with sustainable requiring all key result areas to be considered. At the second level is real time risk reduction, which involves providing users at severe risk with a specific

warning to enable them to take mitigating action. The third level is about reducing the crash risk which involves applying the road design standards and guidelines, improving driver behaviour and enforcement (Wikipedia).

Figure (2.1) Road Traffic System of Interlinked Factors



Source: WHO (2011)

Any road traffic system is highly complex and can be hazardous to human health. Elements of the system include vehicles, roads, and road users along with their physical, social and economic environments. Making a road traffic system less hazardous requires a system approach interaction between its elements, and identifying where there is potential for intervention. There is an opportunity for

intervention in all aspects of the transport system and related systems indicated in Figure (2.1) to reduce the risk of road traffic injuries and deaths. The key message to take from Figure (2.1) is that a road traffic crash is the outcome of interaction among a number of factors and subsystems (WHO, 2011).

2.1.1 Road Traffic Accidents

Road traffic accidents may be defined as a human tragedy, associated with major health problems, negative socio-economic growth and poverty. Road Traffic Accident, RTA is one of the leading causes of preventable deaths worldwide. Road accidents involve high human suffering and monetary costs. Three factors that result in accident are road and environment deficiencies, road user errors and vehicle defects. Road and environment deficiencies account on their own only for 2% of all accidents but in combination with road user error account slightly less than 20%. Human factors for 75-80% of accidents. Typical road and environment deficiencies are those, which provide misleading visual information or insufficient or unclear information to the road users. Human factors include excessive speed for the conditions, failing to give way, improperly overtaking or following too close and general misjudgments by both driver and pedestrian.

Road traffics accidents contributed and are occurred due to road users. The users of a road include pedestrians, cyclists, motorists, their passengers, and passengers of on-road public transport. There are so many issues related to the traffic rule violations such as wrong sense of driving, which involve drunken driving, over speeding, jumping the red lights, lane violation, not wearing seat belts, etc. In this background it is of paramount importance to continue the road safety awareness targeting the road users and is fundamental for developing a bottom-up approach for inculcating and developing a sense of responsibility about various aspects of road safety (WHO, 2011).

2.1.2 Road Traffic Injuries

Road traffic injuries are currently estimated to be the ninth leading cause of death across all age groups globally, and are predicted to become the seventh leading cause of death by 2020, according to a World Health Organization (WHO) and World Bank report on “The Global Burden of Disease” (1999). This rise is driven by the escalating death toll on roads in low- and middle-income countries –particularly in

emerging economies where urbanization and motorization accompany rapid economic growth. In many of these countries, necessary infrastructural developments, policy changes and levels of enforcement have not kept pace with vehicle use. In contrast, many high-income countries have managed to break the link between rising motorization and road traffic deaths, with some managing to dramatically reduce such deaths. These achievements are the result of making infrastructure safer, improving the safety of vehicles, and implementing a number of other interventions known to be effective at reducing road traffic injuries. Having good quality data to monitor the impact of these efforts is also critical to demonstrating their success.

2.2 The Scale of Road Safety Problems in the World

Road Traffic Accident, RTA is one of the leading causes of preventable deaths worldwide. Road safety is primarily meant about the protection and security of all those who travel on roads. It encapsulates all from pedestrians to animal-drawn vehicles and from two-wheelers to all types of multi-wheel transport. It is a double-sided and complementary exercise and will bear less fruit if it is minus anyone; that is to say, everybody will have to honour other's rights to see his ones respected.

Public awareness of death and injury on the roads in the world is quite a recent phenomenon and is due partly to the publication in 2016 of the World report on road traffic injury prevention, produced jointly by the World Bank and the World Health Organization. This report gives an idea of the scale of the crisis and proposes practical recommendations based on current knowledge about what works.

Three thousand people, including 500 children, are killed every day on the world's roads. More than eight out of ten deaths occur in low- and middle-income countries. This amounts to 1.2 million deaths a year. In addition, more than 50 million people are seriously injured; many are disabled for life. It is also worth noting that these figures, as shocking as they are, are an underestimate of the real scale of the problem. Due to underreporting and insufficient data collection, many low- and middle-income countries do not know exactly how many of their citizens die or are injured in road crashes annually.

Road crashes already kill as many people annually as major pandemics such as malaria or tuberculosis. They are the first cause of mortality among men and women aged between ten and 45, except in the country's worst affected by HIV/ AIDS. This

comparison illustrates the gravity of the problem and the urgency to take decisive action (WHO, 2018).

Table (2.1) 10 Leading Causes of Global Burden of Disease

Rank	1990	Rank	2020
	Disease or injury		Disease or injury
1	Pneumonia	1	Heart disease
2	Diarrhea	2	Depression
3	Prenatal conditions	3	Road Traffic Accidents
4	Depression	4	Stroke
5	Heart disease	5	Chronic lung disease
6	Stroke	6	Pneumonia
7	Tuberculosis	7	Tuberculosis
8	Measles	8	War
9	Road Traffic Accidents	9	Diarrhea
10	Birth defects	10	HIV/ AIDS

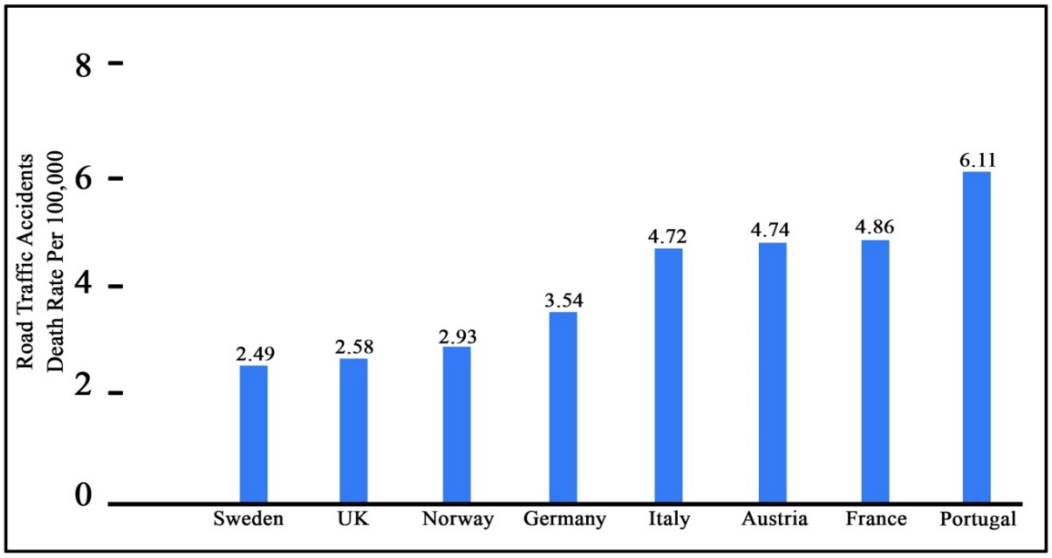
Source: WHO (2018)

Table (2.1) indicates that the death and injury caused by road traffic accidents stand at 9th place in 1990 but it is predicted that it would be at 3rd place in 2020.

Road Traffic Fatalities by World Regions

The World report indicates that the number of road fatalities will increase worldwide by 60 per cent by 2020. Although they will continue to fall by 20 percent in high-income countries, they are likely to grow by 80 per cent in low-and middle-income countries unless targeted steps are taken immediately.

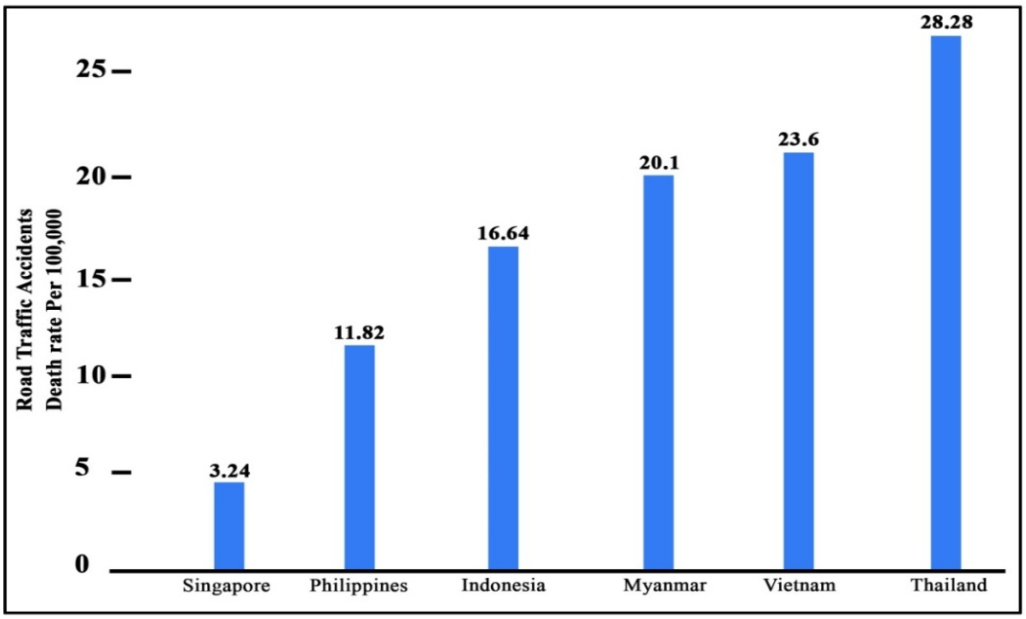
Figure (2.2) Road Traffic Fatalities in Europe Countries



Source: WHO (2018)

In Figure (2.2), the average rate of the Europe region countries road traffic fatality rate is at 4 per 100,000 populations in 2017. It is very low at the global average rate of 17.4. Variation in fatality rates within the countries, ranging from 2.49 to 6.11 per 100,000. Portugal is the country with highest fatality rate of 6.11 and Sweden has the lowest rate at 2.49 per 100,000. United Kingdom is second lowest road traffic fatality rate of 2.58.

Figure (2.3) Road Traffic Fatalities in ASEAN Countries



Source: WHO (2018)

Figure (2.3) shows road traffic fatality rate of some Asian countries. Singapore is an only country with very low death rate in the South East Asia countries. Philippines and Indonesia is at the below level of global average rate, 11.82 and 16.64 respectively. Myanmar is at above the average rate with 20.1, as it is not a very high rate compare to other developing nations. Thailand has the highest road traffic fatality rate among these six south East Asia countries with rate of 28.28 per 100,000 people.

2.3 Global Situation on Road Safety Improvement

Speeding up the process of political decision-making and disseminating good practice are the two main objectives of road safety mobilization and forums. World Health Day in April 2004 was devoted to road safety and marked a major turning point in global awareness of the problem. It gave publicity to the World report on road traffic injury prevention, which serves as a benchmark publication on current road safety and which we would encourage those interested in road safety to consult. The report gives a clear description of the most relevant road safety issues and proposes practical solutions, most of which are summarized in this practical guide for the special use of the International Red Cross and Red Crescent Movement (IRCRCM).

Following World Health Day 2004, the United Nations (UN) adopted several resolutions on road safety for the first time in its history. These resolutions urged member states to follow the recommendations of the report and to combat road violence with greater determination. WHO was given responsibility for coordinating the efforts of the UN agencies working on road safety, especially through its regional commissions.

A global platform was established, including the UN agencies and some 30 active organizations, including the International Federation of Red Cross and Red Crescent Societies and the Global Road Safety Partnership (GRSP). This forum, known as the United Nations Road Safety Collaboration (UNRSC), meets twice a year to compare initiatives and pool activities (International Federation of Red Cross and Red Crescent Societies, 2007).

2.3.1 World Health Organization (WHO)

WHO support Road Safety measured around the world to ensure road safety remains on governments' agendas. WHO is also coordinator of the United Nations Road Safety Collaboration, an informal consultative mechanism which facilities

cooperation and coordination among United Nations agencies and other international partners to implement United Nations General Assembly resolutions and the recommendations in WHO's reports. WHO promoted and coordinated initiatives such as the Decade of Action for Road Safety 2011-2020 and invited global road safety actors in a range of sectors to exchange knowledge and data on injury prevention. In 2009, WHO published the Global Status Report (GSR) on Road Safety, the first global assessment of the road safety situation in 178 countries. In addition to that, WHO coordinated road safety initiatives across the United Nations system and help media to access experts in road safety and related experts in many countries (UN, 2004).

2.3.2 Asian Development Bank (ADB)

ADB has established a Road Safety Group to strengthen its road safety capacity and support road safety work across ADB projects. A Road Safety Group (RSG) was established to lead and coordinate the strengthening of ADB road safety capacity and support the road safety operations of regional departments. ADB is building up a pipeline of project preparatory technical assistance, policy and advisory technical assistance, and capacity development technical assistance, allowing road safety activities to be strengthened in a sustained manner. ADB provided main streaming and strengthening road safety components. This included (i) strengthening road safety components is ongoing investment projects and technical assistance by improving design, attracting additional funds, and monitoring road safety inputs better and (ii) mainstreaming road safety components in new projects by including these in project design and increasing their importance in the design phase. ADB endeavored to ensure region received a commensurate share of global resources to address road safety and assist with the administration of such funds are needed (ADB, 2012).

2.3.3 ASEAN Regional Road Safety Strategy

The ASEAN Regional Road Safety Strategy was officially adopted on November 2015 at the 21st ASEAN Transport Ministers Meeting. It is proposed that the key Strategic Directions for the ASEAN Regional Road Safety Strategy (ARRSS) should focus on the four aspects of harmonization of standards, road rules and legislation, capacity building, knowledge development through research and evaluation and monitoring and reporting progress which are most relevant at the

regional level and where a regional progress which are most relevant at the regional level and where a regional approach will support and facilitate actions taken by individual countries. The 5 pillars of Decade of Action for Road Safety has proposed 5 pillars of road safety which provide a useful framework for road safety strategies at the global, regional and national levels: road safety management, safer road and mobility, safer vehicles, safer road users and post- crash response. The previous ASEAN regional road safety strategy and action plan entitled “Arrive Alive: ASEAN commits to cutting road deaths” covered the period 2005-2010.

ASEAN countries have progressed in terms of the five pillars outlined in the UN Decade of Action (WHO, 2013). To enable this comparison, a new index for measuring the extent of road safety maturity (RSM) was constructed from a numerical weighting based on the information provided in the WHO Global Status Report for 2015.

The first Pillar, ‘Institutional framework’, has an average maturity score of 89 per cent for the ASEAN region, with all of the ASEAN members having at least 70 per cent of the criteria fulfilled. The Philippines, Indonesia, and Malaysia have the best performance in the group with a complete fully funded institutional framework. Pillar 2 “Safer roads and mobility” has an average maturity of 66 per cent for the ASEAN region. The development of the infrastructure projects in Southeast Asia incorporates auditing of new road constructions. Almost two-third of the countries has regular inspections for existing road networks, and another third conduct inspection in parts of the network. The development of safer roads needs further attention in Thailand. For Pillar 3 “Safer vehicles”, the indicators which are presented in the 2013 report have been retained, rather than updating to the 2015 report, because the 2015 indicators are less relevant for ASEAN member states. An average maturity of 60 percent for the ASEAN region, in terms of vehicles, regulations for seat-belts in front and rear seats have not been introduced by some ASEAN members. Likewise, few have accepted the resolution of the UN World Forum on Harmonization of Vehicle Standards or have a new car assessment program. Improving the safety of road users is the most challenging element for the ASEAN region. Pillar 4 ‘Safer Users’ has an average maturity of 40 per cent for the ASEAN region. All the countries in the region have national laws relating to speeding, drink-driving and motorcycle helmets.

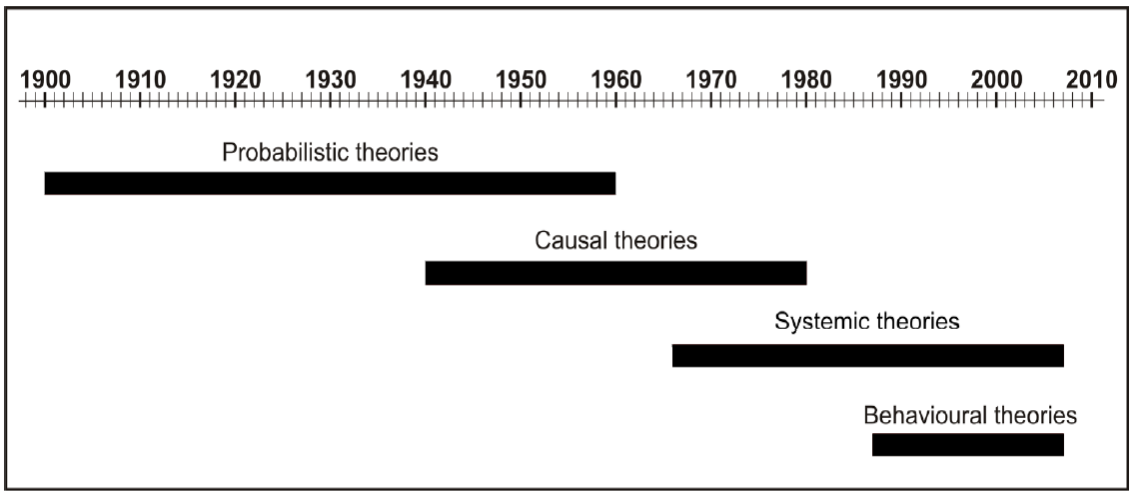
2.4 Road Safety Theories and Models

Road safety has been studied, analyzed and improved for more than a hundred years. This work has produced a number of theories and accident models, including models of road accidents. It is safe to say that road safety is a full-fledged scientific field of study comprising a number of elements which can be arranged in the shape of a pyramid (base sciences, related disciplines, theories, models and experiments). The scientific discipline of road safety draws on the experience of many base sciences (techniques, medicine, social behaviour) and many scientific disciplines (mathematics, physics, road traffic engineering, highway engineering, safety, transport, education, psychology, sociology, ergonomics, medicine, law, urban planning).

Theory is a systematically organized knowledge explaining a specific field of reality which can be applied in a broad scope of possibilities or circumstances and based on a system of assumptions, accepted laws and principles of analysis, forecasting or explaining nature or a specific behaviour of a set of phenomena. With this definition of theory in road safety there is further distinguished four basic types of theories: stochastic, causal, systemic and behavioural.

It has been a hundred years since the first attempts at explaining the different aspects of how road accidents happen. Within the time there have been many theories explaining why accidents happen. There are four periods of the history of road accident research. These are given in Figure (2.2). Each of these periods was dominated by one of four groups of road accident theories: stochastic, causal, systemic and behavioural.

Figure (2.4) Evolution of Road Safety Theories and Models



Source: Kazimierz Jamroz (2008)

Stochastic theory is also known as kinetic theory. A stochastic theory is any process describing the evolution in time of a random phenomenon. The stochastic processes were settled around 1950. Since then, stochastic processes have become a common tool for mathematicians, physicists, engineers, and the field of application of this theory ranges from the modeling of stock pricing, to a rational option pricing theory, to differential geometry.

Stochastic theory dominated road accident analyses in the first half of the previous century. Within this period road accidents are analyzed as random events and from the point of statistical accident theories. The precursor of this theory is Bortkiewicz, who discovered that the distribution of killed in a year is almost perfectly random and the Poisson model gives a good description of the random process. The use of other stochastic models to describe road safety in detail such as regression, time series, stochastic processes, spatial, econometric, etc. However, stochastic theories and models are not enough to describe a road accident and suggest relevant road safety measures.

Causal theories of accidents claimed that only an exact knowledge of the real factors causing accidents can help to prevent them. There are two main trends in causal accident theories: deterministic (sequence of events) and probabilistic (set of factors). Heinrich is considered the precursor of the theory based on the sequence of events. According to casual theories, human factors are a major research problem. Many of the studies since the 1960s suggested a strong contribution of the human factors in causing accidents. It is estimated that as much as 60% of accidents in industry, 70 – 80% of accidents in aviation and 85 – 95% of road accidents are connected with human factors. There are two approaches to analyzing human factors: causal and systemic.

There have been a number of studies on the influence of the human factor on traffic user behaviour and road safety. Four main types of driver behaviour have been identified, which directly lead to accidents: distraction, carelessness and misperception, drowsiness and risky, competitive and aggressive behaviour. But still there are many types of problems caused by new vehicles and new elements of transport infrastructure and how these affect road user behaviour and safety that must be studied. As an example, the dynamic space of visibility, drugs used by road users.

Systems theory defines the trans-disciplinary study of the abstract organization of phenomena, independent of their substance, type, or spatial or temporal scale of

existence. It investigates both the principles common to all complex entities, and usually mathematical models which can be used to describe them. According to the theory none of the elements can be considered more important than the others. It claims that people make mistakes because the system has the wrong design and does not match human abilities. Consequently, this theory combines information from individual accidents and creates an area of knowledge on the system and its stability, because the individual layers or levels of the system increase the risk of an accident.

The theory of systems applied to road transport is designed primarily to eliminate accidents by modifying the technical elements of the transport system. The systemic theory is so far the best. The improvements in the roads system, traffic enforcement and vehicle design have significantly reduced accident rates and casualties in western countries. Systemic theories and models are used to identify the relations and dependencies that have an effect on accidents (so called factors transferred in time and space) and factors that occur at the time and place of the road accident to build a system of road safety measures, monitoring and control of the dependencies and relations. An example of this approach is a preventative program known as the Haddon matrix that is considered the precursor of the multi-disciplinary approach to road safety and credited with building the basis for systemic studies.

The Haddon matrix is improving road safety which involves identifying the risk factors that contribute to crashes and injuries, then identifying the interventions that reduce the risks associated with those factors. A reference framework for identifying factors that have an impact on road traffic injuries is the Haddon Matrix, which divides factors into human, vehicular and environmental causes across three temporal phases: pre-crash, crash and post-crash (Haddon, 1980).

Table (2.2) Haddon Matrix

Phase		Human	Vehicle and Equipment	Environment
Pre-crash	Crash Prevention	Information Attitudes Impairment Police enforcement	Roadworthiness Lighting Braking Handling Speed management	Road design and road layout Speed limits Pedestrian facilities
Crash	Injury prevention during the crash	Use of restraints Impairment	Occupant restraints Other safety devices Crash protective design	Crash-protective roadside objects
Post-crash	Life sustaining	First-aid skill Access to medics	Ease of access Fire risk	Rescue facilities Congestion

Source: Haddon (1980)

The matrix is useful and effective tool for revealing where and when to best conduct traffic safety interventions and for fostering cooperation among different agencies. It illuminates injuries in terms of causal and contributing factors, as well as in terms of a time sequence consisting of pre-event, event and post-event phases. The Haddon Matrix consists of four (or three) columns representing the causal agents in the crash: the driver, the vehicle and the physical and socio-economic environment, and three rows representing time phases: pre-crash (before a potential vehicle collision), crash (the actual event), and post-crash (the immediate aftermath).

The basic assumption of all behavioural theories is how people assess risk and accept it as a very important determining factor of accidents similarly to the previous theories. There is no doubt that road safety relies on the successes of road safety programs. The more the public want to prevent accidents, the greater the acceptance of more stringent road safety measures there are several groups of theories here as well: homeostasis of risk, behavioural adjustment and change of health behaviour. Homeostasis is the body's ability to maintain a constant interior environment which is possible thanks to adjustment mechanisms based on feedback irrespective of external

factors. The theory of behavioural adjustment is more limited. It assumes that road users adjust their behaviour to risk factors and road safety measures to a greater or smaller extent, but not to compensate entirely for risk factors which cause behavioural adjustment.

According to the theory of heath changes, the number of casualties or the likelihood of becoming a casualty in an accident depends on the following elements: health promotion (education, motorization, communication with the public, programs, policy, legal regulations, organizational changes), human factors (local level, social level) and behaviours and the environment. The theory helps to explain which behaviours and environmental factors are responsible for increasing the number of casualties and suggest safety measures. Road accidents and casualties are an important element affecting public health, which makes this theory worthwhile.

2.5 Main Factors of Road Traffic Accidents

All countries which have managed to reverse sustainably the rising trend of road casualties in the past 30 years have one thing in common: political awareness. Unless policy-makers are won over to the issue of road safety, little can be done.

The growing political awareness in high-income countries led rapidly to the establishment of special road safety departments, which could put forward action plans coordinated and funded by multiple relevant sectors. Road crashes often result from a series of root causes: the vehicle, a factor in 5 to 10 per cent of crashes, road infrastructure which 10 to 20 per cent of crashes may be attributed and road user behaviour which is responsible at least in part for some 80 to 90 per cent of road crashes (IFRC, 2007).

It is important to consider the vehicle, the road, the user as a system and environmental factor. The interactions between users and the physical elements are critical. Road and vehicle design must allow for human errors.

2.5.1 The Vehicle

Modern vehicles are considerably safer than older models. Manufacturers tend to agree that it will take time for future technological breakthroughs to make more advanced safety improvements. Technical safety standards and annual vehicle testing are compulsory in high-income countries.

In contrast, low- and middle-income countries often have a substandard vehicle fleet, which exacerbate the road safety problem. This is particularly true for commercial vehicles such as taxis, buses and trucks, which account on average for 50 per cent of all vehicles in those countries. Effective and independent technical testing needs to be introduced as soon as possible in particular for commercial fleets. Testing must be strict where the vital safety functions of vehicles are concerned, such as braking, shocks and lighting.

Another matter of concern in low- and middle-income countries is the overloading of commercial vehicles transporting goods or passengers (or both at once, as is often the case). It is essential to have regulations establishing maximum loads and that regular checks take place. Greater improvement of the public and commercial transport sector is one of the best ways of avoiding such overloading. Although the standard of a vehicle's safety features is a critical part of the road safety system, substandard vehicles are still only the third main cause of road crashes. Road infrastructure is second (IFRC, 2007).

2.5.2 The Road Infrastructure

The road infrastructure, considered as a whole (including road surface, road signs and design), is a significant safety factor. Road designs should recognize that humans make mistakes and try to minimize the consequences of human error. It has been shown that some low-cost infrastructure improvements can substantially reduce the occurrence of road crashes and their severity. Examples of improvements include the separation of different types of traffic, better road markings and road signs, safer paths for pedestrians and two-wheelers, the construction of sidewalks or pavements and more visible pedestrian crossings, and slower traffic speeds with the use of road humps, rumble strips and roundabouts.

On existing roads, these improvements should first be made at high-risk spots, where many crashes occur, especially at the entry and exit of built-up areas and areas of high activity such as markets and schools.

The same improvements should be incorporated in the design of new roads, which may otherwise become a source of crashes in the future. It is essential that road construction budgets for future roads include a provision for safety, which is by no means the case everywhere in the world. Practical technical guides are already

available. Unsafe road infrastructure is a critical root cause of road crashes but it is by no means the main cause (IFRC, 2007).

2.5.3 Human Behaviour

The behaviour of road users is, in fact, the main cause of road crashes and road crash injury and death. Among the many risk factors involved in causing road crashes or increasing injury severity, the most common are: the failure to wear seat belts, driving at excessive or unsuitable speeds and driving under the influence of alcohol. Each of these primary risk factors is involved in 30 to 50 per cent of fatal or disabling crashes worldwide, irrespective of the country.

There are other substantial risk factors, such as driver fatigue (which affects long-distance commercial transport drivers in particular), the use of mobile telephones, driving under the influence of drugs, failure to observe safety distances and a lack of visual aids for drivers. None of these risk factors should be overlooked.

There are also the basic rules of the Highway Code, which users should comply with, such as the rules for giving way, overtaking, traffic lights and no-entry signs. For brevity and greatest impact, authorities have deliberately concentrated on these major risk factors, which are the cause of most road deaths (IFRC, 2007).

2.5.4 Weather Conditions

Driving in poor weather conditions can cause serious traffic accidents. Car after car can crash into each other, crash with road side barrier or other obstacles because of lowered range of sight and lowered grip of the car. Especially when the rain and winter comes, the main suspect for causes of car accidents is bad weather.

There can be many factors which count as poor conditions and could possibly cause car accidents. The most common ones are driving in the snow, driving in the rain and riving in a fog.

Each and every one of these poor conditions causes drivers to have a lowered range of sight, especially if the conditions are severe such as a heavy snowstorm, monsoon, and a very thick fog. These can lower the driver’s vision to just about a few meters which make is practically impossible to see the road ahead. And it can get even worse if more than one of these is active. Other road conditions which could potentially cause auto accidents are high winds and a very wet road (IFRC, 2007).

2.6 The Traffic Safety Management and Preventive Strategies

The traffic safety management includes traffic safety administration management, traffic safety technical management and safety facilities management.

2.6.1 Traffic Safety Administration Management

Traffic safety administration management includes the mechanism of the traffic safety management, policy and administrative information system of technology, etc.

(i) Mechanism of the Traffic Safety Management

The traffic safety management refers to the construction and maintenance, management of the vehicle, establishment and execution of the regulation of the road, training and management of the driver, traffic participants' understanding of traffic rule, etc. It is a comprehensive and social system.

(ii) Policy of the Traffic Safety Management

It's planning and management is belonging to government's functions. The main contents of the policy of the traffic safety management include legal system, legislation and executing the law, technical policy, norm and standard, etc. An important policy is to make the sustainable development strategy for the traffic.

(iii) Information System of the Traffic Safety Technical Administrative Management

Information System of the Traffic Safety Technical Administrative Management is to regard computer as the platform, based on database, and make people receive the information of traffic safety technical administrative management accurately more directly. The main contents include mode, form, gathering, dealing, and storing, searching and feed backing the system.

2.6.2 Traffic Safety Technical Management

The traffic safety technical management is comprehensive, and considered from the influence factors of the traffic safety, it carries on from such respects as people, vehicle, road and environment.

(i) Traffic Accidents Analysis

The statistics analytical work of the traffic accidents is the base work in the traffic safety management. It can draw the frequencies and characteristics of the traffic accidents in different regions, different times, different crowds and different kinds of vehicles by the statistical analysis of the traffic accidents. It offers the important basis to the analysis and judgment of the origin causes of formation of accidents. Statistics of traffic accidents realizes the state traffic accidents happening in and essential feature from macroscopic, and reveal when, where and which kind of condition would tend to cause the traffic accidents. It reveals also the difficult point of controlling and preventing, and point out the directions for the prevention of the traffic accidents. The distribution of the traffic accidents is the basic to prevent the traffic accidents, control countermeasure and measure.

(ii) Person Management

The person management is considered on defending different fields such as human body, psychology. Road traffic accidents always connect with motor vehicle together because only motor vehicles have strong lethality and destroying strength. Physiology and psychology of driver include driving behind the wine (medicine) and fatigue driving, not obeying the traffic regulation to give way, going over the speed limit and negligence and those phenomena violating the regulations is become the major part of the causes of accidents. Therefore it should improve psychological quality of the drivers by the traffic safety management.

(iii) Vehicle Management

Vehicle is an important element of the traffic system of the road which has close contacts with traffic safety. Though in the statistic of the traffic accidents, the reason of the driver accounts for sizable proportion and the accidents directly caused by vehicle problem do not exceed 10%, but this does not mean the vehicle has a little effect on traffic safety of the road. So vehicle should be managed to improve the safe practice. Before the vehicle registers the license or in the charge stations and vehicle measuring stations, it examine regularly the design ofappearance and center of the vehicle, break technology, break performance, slip resistance performance of tire, seat safety belt, safe airbag, light and wiring system, wheel turning performance in fixed position. It defends and prevents trouble before it happens.

(iv) Road Management

While human behaviour is a significant factor in causing crashes, the road itself is also important because it can have an effect on human behaviour. Good roads can also play an important role in reducing accident severity. Those substandard roads which surface are narrow, low quality and slope heavy and line shape can mislead to the drivers and pedestrians which cause the emergence of the traffic accident. So, check to the special road to pinpoint the problems and put forward the corresponding measures in time, avoiding the traffic accidents to happen.

(v) Environmental Management

Environmental management main includes separating the going of motor vehicle and non-motor vehicle effectively, controlling the road traffic, setting up the essential safety devices such as slope falls, cut curved, setting up guard rail, traffic sign, marking, green coverage plan straight road to lightening the driver's tired degree, lighting condition of the road. Through the environment of management in the road, carrying on overall and systematic management to the traffic environment, reducing the traffic accidents caused from problem of the traffic environment.

2.6.3 Traffic Safety Facilities Management

The traffic safety facilities management includes road safety facilities management, the vehicle safety facilities management, the driver safety facilities management, the pedestrian safety facilities management, disable person's safety facilities management, traffic safety training facilities and rescue facilities management.

(i) Road Safety Facilities Management

The road safety facilities management is permanent and provisional facility management. Permanent road safety facilities management include all kinds of defending facility management to maintain normal road such as defending the leaving stone, collapse, roll away from, enter, over speed limit, over lengthy and ultra wide, showing the way and leading. Provisional facility management is direct temporary needs against such as constructing line, temporary derangement, temporary parking safe protection management, etc.

(ii) Vehicle Safety Facilities Management

The vehicle safety facilities management is generally that facilities are managed to prevent the trouble of the vehicle or the emergency such as the anti-collision buffers of system, car- following distant security measuring warning system, travel route deviating from changing the warning system.

(iii) Driver, Pedestrian and Disable Person Safety Facilities Management

It offers a kind of management of the security service to different traffic participants, for example guiding road to handicapped, leading and offering pedestrian route choose to take refuge and facility management when disaster is taking place.

(iv) Training Facilities of Traffic Safety Management

The training facilities of traffic safety management are to train the driver form discipline and quality and propagate participant's traffic safety consciousness education. It is a long-term work of getting a permanent cure and socialized system engineering. With the fast development of economic construction, the traffic safety trains and educational work obviously is important and indispensable.

2.7 Review on Previous Studies

Many researchers have come out with the causes, effects and recommendations to road traffic accidents.

Deus Damian Komba (2006) from Norwegian University of Science and Technology conducted a thesis that describe the risk factors and road traffic accidents in Tanzania. The study represents understanding what risk factors contribute to the occurrence of road traffic accidents and related injuries in a restricted risk area in Tanzania. The study describes the composition of motor related injuries including non-motorized casualties in Kibaha district in Tanzania. The thesis assesses different road safety measures taken by the local authorities to prevent accidents in Kibaha district.

In a research conducted by Kassu Jilcha (2009), the growing problem of road traffic crashes, particularly in roads from Gelan to Tukurwuha with particular reference to the magnitude, risk factors, interventions and counter possible solutions to so many problems of the roads traffic accidents in Ethiopia are also examined. This study analyzed the traffic accidents and develops a preventive strategies and possible

counter measures for the route selected with main functions. The aim is to provide users with an understanding of the major causes of traffic accidents and present using several Statistical tools. The 2004 World Health Report shows that of the 1.2 million people killed in road crash worldwide, 85% are in developing countries.

Saw Aye Ko Ko (2002) described the different rules to be followed by motorists, motor cyclist, slow moving vehicles, bicyclist, pedestrian and passengers and laws. He observed the causes of various types of accidents with case study in Yangon during the period of 1992 to 2001. He identified that negligence drive is the root of the accidents, passenger buses was highest accident and day time is the most accident happened. In 1992, there are 796 accidents and 153 people were killed.

Moh Moh Khine (2006) conducted the thesis that described the integrated national road safety program, road safety trend in the world, road safety related organizations, a systematic methodology of road accident cost, road safety audit, focus on urban safety management, ADB strategies, vision and goals and analysis of road safety conditions and major problems on road safety in Myanmar. During her study period of 1999 to 2003, there are only 8 to 9 vehicles per 1000 people in Myanmar.

Kaung Myat Nyi (2011) analyzed the road accident data during his study period of 2005 to 2010 in Yangon. In this study, males are more suffer the road traffic accident than female, the age between 26 to 45 years as committed the highest portion. By analyzing traffic accidents rate in time portion, the early morning session was the least traffic accident and evening and night time was the most traffic accidents occurred. His study shows that bus and light truck group were generally five times more than saloon in rate of accident. Yangon and Mandalay cities are the most severe accidents happened in Myanmar.

According to Win Myint Tun (2012) thesis, there were a total of 1317 accidents which killed 129 people in 2006 and it was the highest rate among ten years from 2002 to 2011. Highest accidental vehicles occurred in Public transportation bus and negligence drivers were the major cause in Yangon city. It was observed that in 2010, the road accident cost of Yangon city was 31,284 million that is 0.38% of the GDP of Yangon city. Based on his findings, negligent drive was the main cause of the most accident in Myanmar.

CHAPTER III
ROAD SAFETY PROGRAMS IN MYANMAR AND OVERVIEW OF YANGON - MANDALAY EXPRESSWAY

3.1 Highway Transport System in Myanmar

Like most other countries in the world, road transportation is the most important communication in Myanmar. Most towns and cities are accessible only by land route. Only a few towns and cities are connected by railway lines. Even if they are connected by rail link, the condition of train services are too difficult for most ordinary people to use railway as the major means of travel in the country. Some towns are also reachable by rivers but river travel is very slow compared to road transportation, so it is not always practical. Thus, most people have to rely on road transportation to travel in Myanmar.

According to official figure in 2011, there are three major highways and one national expressway with a total length 142,395 km running nationwide.

There are three main highways or corridors running north-south in Myanmar.

- Yangon – Mandalay Highway. The road passes through major cities in the central Myanmar such as Bago, Taungoo, Pyinmana, Naypyitaw and Meikhtila. This road is 695 km long.
- Yangon – Pyay Road. This road was built by the aid of the Japanese Government, and considered the best highway in Myanmar. It runs west of the Bago Range (Bago Yoma) and has a length of 288 km.
- Western Union Highway. This is part of a proposed Pathein – Monywa Highway, which connects towns and cities on the west of Irrawaddy River. This road is approximately 740 km long.

There is one expressway also call as National Expressway. The Yangon-Mandalay Expressway is the only expressway in Myanmar featuring a double carriageway and four lanes in good condition on its entire length of 587 km. This

expressway runs from Yangon via Nay Pyi Taw, Meik Htila to Mandalay. Trucks are not allowed to use this expressway and must use the old Yangon-Mandalay highway.

Amongst above highways, the new expressway in Myanmar has become the most important major route for land transportation in Myanmar. It has contributed enormous benefits and save both time and money for all citizens of Myanmar. However, due to that new expressway, a lot of numbers of unwanted vehicle accidents and crashes have figured out as the side effect of expressway. As the gradual increasing rate of cars and its consequence of these inauspicious and terrible accidents and crashes, the actions of policy makers on reduction of those accidents exist as hard and tough challenge for the policy makers. The weak and inadequate support of road infrastructure can be said one of the reasons of occurring accident and on the other hand, the lack of following and applying traffic and road rule by drivers was occupied many percentage of the reason. The authorities always try to resolve those accidents. For the government side, they should take responsibility to rebuilt and maintain the road infrastructure, legislating new traffic rules and then giving orientation about the traffic rules and maintaining the discipline by punishing or fining need to be carried out. Myanmar has faced a lot of difficulties in implementing policies for traffic and road rules such as the defect of human resource, insufficient budget and the deficient implemented facilities because of being a developing country.

3.2 Legal Framework for Road Safety in Myanmar

In Myanmar, legislative measures for road transport are enacted since 1915. Before 1964, The Burma Motor Vehicle Rules (1915), The Motor Vehicle International Circulation Rules (1933) and The Burma Hired Motor Vehicle Rules (1935) are empowered for road transport and traffic operations. In 1964, Motor Vehicle laws was formulated and in 1989, it was appeared the law amending the 1964 Motor Vehicle law. Motor Vehicle Rules is also enacted in 1989. In the same year, directive on road signs, road marking and signals are regulated in line with international convention on road signs and signals of 1986. Currently, the 1964 laws, 1989 rules and directives are empowered and the former three rules are null and void by the later. On the other hand, there also exists Penal code for enforcement for disobedience to existing traffic laws. Highway laws are also in empowerment.

The following are the brief outlines of existing empowering traffic safety concerned laws and rules.

(i) "1964 Motor Vehicle Law" comprises of seven scopes such as preliminary of motor vehicles, third party insurance, issuing driving licenses, speed limit, offences and punishment and miscellaneous.

(ii) "1989 Motor Vehicle Rules" has 10 chapters such as title and definition, registration of motor vehicles, condition of motor vehicles, issuing driving license and conductor license, driving training school, terms and condition of tired motor vehicles, motor vehicle traffic, pedestrian rules, cyclists rules and road signs, marking and signals.

Road signs are classified into four groups: danger warning, prohibitory and restrictive, mandatory and direction. Road markings include two items and signals include 5 groups involving light and band signals. This directive is enacted in Myanmar in line with the Vienna convention on road signs and signals of 1968. In Panel code, there includes four sections for the faulty driving. To be mentioned -

8-279	Rush (reckless/ speeding) driving or riding on public place.
8-337	Causing hurt by act endangering life or personal safety of others
8-338	Causing serious hurt by act endangering life or personal safety of others
8-304 (A)	Causing death by negligence

Punishment can be withdrawal of driving license for a certain period or whole life as the minimum level and can extend to imprisonment or fine or both. The trials are prosecuted form township courts to supreme or high courts of justice as cases are concerned.

3.2.1 Myanmar National Road Safety Action Plan (MRSAP)

Building road safety management capacity in low- and middle-income countries to achieve road safety goals requires a systematic response and sustained long-term investment. Critical issues at the country level are how to build capacity through institutional reforms, how to accelerate knowledge transfer; how to scale up investment, how to increase international cooperation and development aid sustainably, and how to allocate increased resourcing from the government over time.

Myanmar National Road Safety Action Plan (2014 - 2020) is being implemented which is aligned with UN Resolution on road safety and road safety

guidelines of Asia Development Bank (ADB). The objective of Myanmar National Road Safety Action Plan was to reduce the loss of people's lives and socio-economic caused by traffic accident, the environmental impact and traffic congestion. The Action Plan was launched intending to reduce 50% of road fatalities rate during (2014 - 2020) period targeting the following objectives;

(a) To save many lives by reducing the annual fatalities of road accident in order to halve current death during 2014-2020
(b) To reduce 50% of fatal rate in 2020, which is now 9.26 death rate for 10000 vehicles in 2013
(c) To make 90% wearing of motorcycle helmets all over the country
(d) To make 70% wearing of seat-belts all over the country
(e) To eliminate illegal driving without driver's license

There are 12 sectors of National Road Safety Plan (2014 - 2020) as follows:

(i) Coordination and Management for Vehicle and Road Safety
(ii) Traffic Legislation
(iii) Vehicle Safety Standards
(iv) Driver Training and Testing
(v) Safe Planning and Testing
(vi) Improvement of Hazardous Locations
(vii) Publicity, Campaigns and Road Safety Education for Children
(viii) Police and Law Enforcement
(ix) Accident Data Systems, Road Safety Research and Road Accident Costing
(x) Emergency Assistance to Road Accident Victims
(xi) Funding and Role of Insurance
(xii) Cooperation and Collaboration

3.2.2 Insurance Policy for Highway Travelers in Myanmar

As the number of accidents on Myanmar's roads appears to be rising, drivers and passengers have to purchase a new insurance policy specifically covering them in case of accidents on the country's highways.

The busy stretch of poorly built road has become a hotspot for accidents in recent years. According to the Insurance Business Supervisory Board, government-

run Myanmar Insurance and 11 private insurance companies began selling a policy named Special Travel Insurance for Express Ways. The policy cost just 300 kyat, or about US$0.30, for one unit, with individuals only permitted to buy up to two units at one time. The terms of the policy, which are fixed across the different providers, include a payout of up to 3.5 million kyat, or about $3,500, in the event of death and up to 2.4 million kyat in medical costs. Myanmar Insurance was selling travel insurance already and this new travel insurance is especially designed for highway passengers. The policy can be bought along with bus tickets or directly from insurers for those in rental vehicles. Most insurance in Burma is provided by the government's insurer, but now seven types of insurance have been opened up to private companies. Although there is travel insurance for travelers currently, to be covered more efficiently, this new Special Travel Insurance for expressways was implemented.

3.2.3 Myanmar Expressways Law

Myanmar Expressways law was launched on 9th April, 2015 by The Pyidaungsu Hluttaw as Law No. 24 / 2015.

The Objectives of this Law are as follows:

(a) to carry out the construction, extension, maintenance of the expressways and management, supervision of motor vehicle traffic, and the collection of tolls systematically;

(b) to carry out continuously for the safety of the users of the expressways and matters relating to road safety;

(c) to develop the socio-economic life and to increase the living standard of the citizens, to lower transport cost by causing speedy and smooth flow of passengers and goods through using the expressways;

(d) to enable to increase and carry out the development activities of the State in momentum by networking the expressways with the expressways of the countries in the region.

Terms and Conditions and Restrictions

(a) allowing the entering into, exiting from, accessing through interchange which is constructed accessing to the expressway at the specified places for enabling to enter into, exit from, access to the expressway;

(b) crossing through the specified route in crossing and moving from a side of an expressway to another side;

(c) driving on the expressway only by the motor vehicles which are in conformity with the stipulations;

(d) complying with the stipulated terms and conditions relating to the expressway, from time to time, by the Expressway Administration Committee and the Department of Highways;

(e) drive within the speed limit stipulated by the Expressway Administration Committee and the Department of Highways

(f) drive within the warned, indicated and stipulated speed limit at the necessary places and road curves;

(g) drive not more than the stipulated speed limit for safety at the time of bad vision because of bad weather or any other reasons.

3.3 Responsible Bodies for Road Safety in Myanmar

As road safety is an issue which is multi-dimensional as well as multi-sectoral in nature, it needs the collaborate a approach to reach the target point. A wide range of investments, actions, bodies, campaigns are available and responsible to reduce fatality rates and injury rates. Myanmar's transport sector was managed by Ministry of Transport and Communications, Ministry of Construction, Ministry of Progress of Border Areas and National Races and Development Affairs. Government agencies at the national and regional/ state levels will need to respond to different pressures, so separate management arrangements and separate support will be necessary for the two levels - at least in the cases of Yangon and Mandalay regions. Organizations regarded as the responsible bodies for road safety in Myanmar are described as follow:

1. Road Transport Administration Department (RTAD)
2. Traffic Rules Enforcement Supervisory Committee (TRESC)
3. National Road Safety Council (NRSC)
4. Road Safety Task Force
5. Yangon Region Transport Authority (YRTA)

3.3.1 Road Transport Administration Department (RTAD)

RTAD takes the leading role for national road safety. Department objective itself is road safety and it is responsible for road safety measures and regulations.

RTAD implement its objective by vehicle inspection for roadworthiness and registration, testing driving skill and issuing licenses, formulating traffic regulation and road safety implementation and analyzing traffic accident statistics. Road safety management leadership is shared between the RTAD, under the Ministry of Transport and Communications and the Myanmar Police Force, under the Ministry of Home Affairs. The RTAD identified the following needs at the 10 December 2014 workshop in Nay Pyi Daw. They are all important road safety management issues:

(i) Funding;
(ii) Soft and hard infrastructure;
(iii) Human resources;
(iv) Know-how and expertise;
(v) The creation of necessary mindsets and cultures;
(vi) Consolidated collaboration among the government, citizens, and other stakeholders;
(vii) The rule of law and enforcement of the law.

3.3.2 Traffic Rules Enforcement Supervisory Committee (TRESC)

The Traffic Rules Enforcement Supervisory Committee (TRESC) was established in 1988 which has two subcommittees for education and legislation and for enforcement. The Public Works Department, the Health Department, Myanmar Insurance, the Traffic Police and city development committee representatives contribute as committee members. At a local level, road safety actions in Myanmar have traditionally been carried out through a region's or a state's Traffic Rules Enforcement Supervisory Committee (TRESC). The committee is an active body at the state and regional level, especially for Yangon and Mandalay region that supervises road user behaviour, reacts quickly to identify unsatisfactory physical situations on the roads, and seeks modifications of penalties and of legislation.

3.3.3 National Road Safety Council (NRSC)

The National Road Safety Council (NRSC) was established by the President's Office Notification No.44/2014. The council is chaired by the Vice-President. The deputy minister of the Ministry of Transport and Communications and the general of the Myanmar Police Force are the secretaries of the NRSC, while the director general of the RTAD, Ministry of Transport and Communications is the joint secretary.

NRSC membership includes a large number of ministers, especially those of the Ministry of Information, Ministry of Transport, Ministry of Education, Ministry of Health and the Ministry of Construction. The minister of home affairs and the minister of rail transportation were nominated for the two vice-chair positions.

NRSC is mainly responsible for implementing land transport safety policies and define clearly the responsibilities of the relevant departments with regard to the successful and effective implementation of the Road Safety Action Plan, 2014-2020. It seeks funding and human resources for the implementation of road safety measures and to scrutinize the effective use of the resources. It establishes report for any difficulties encountered during the implementation of road safety actions. NRSC also carry out public awareness campaigns about road safety problems that are impediments to improving public health and national economic development. Rasing funds for the road safety action program from contributions by national and international donors and which are to evaluate whether road safety actions are implemented within the targeted time and to monitor and modify the action programs to respond to changed situations. NRSC seek technical assistance for the implementation of road safety measures to reduce environmental damage arising from the use of vehicles. The establishment of NRSC is to reduce traffic congestion and to facilitate research on the improvement of road safety, including through legislative changes when necessary.

3.3.4 Road Safety Task Force

Road Safety Task Force was established and it’s composed of 12 different ministries. The force is chaired by the Ministry of Transport and Communications (MOTC) and the director of the RTAD is the secretary to the taskforce. The task force submitted monthly reports on road safety activities to the National Road Safety Council (NRSC). The National Road Safety Council (NRSC) and Road Safety Task Force acted a major role of implementing road safety activities in Myanmar.

Furthermore, a national road safety team was formed in mid-2014 with representatives from various government departments to advocate traffic rules among the public. In addition, to control, monitor and reform the Yangon local bus lines, the Yangon Region Transport Authority (YRTA) was founded in 8th July 2016.

3.3.5 Yangon Region Transport Authority (YRTA)

YRTA is the operating transit agency for Yangon Region, Myanmar. It was formed on 8 July 2016. It currently operates Yangon Bus Service, which began operations on 15 January 2017. It was reformed and replaced the former bus operating authority known as Ma Hta Tha. YRTA is a authority to supervise especially for the local transportation services in Yangon such as Yangon Bus Service (YBS) and Yangon Water Taxi system. It implements operation of bus routes, support technical assistance and rules and regulations for local public transportation within Yangon city.

3.4 Background Information of Yangon - Mandalay Expressway

The Yangon - Nay Pyi Taw - Mandalay Highway designated as Expressway is considered a very important link of Myanmar's road network, forming part of north-south transporting route linking the nation's capital, Nay Pyi Taw with its largest economic city, Yangon and second largest city, Mandalay. It also serves as vital transportation network which has reduced the travel time between Yangon and Mandalay to 7 hours from 13 hours by train and from 16 hours by the old highway, opened in December 2010 and has 365 miles (587 km). The highway, which does not meet international design because of needy budget, construction and safety standards have seen a spate of accidents since its opening.

3.4.1 Specifications of Expressway

The road surface comprises two layers of concrete: (1) an 8.2 m (27 ft) wide and 15 cm (6 in) thick lower layer, as well as (2) an 7.6 m (25 ft) wide, 30 cm (12 in) thick upper layer. The road can withstand 80 tons. The highway has two 7.6 m (25 ft) wide carriageways, divided by 9.1 m (30 ft) wide traffic islands, and a total of 842 box culverts, 1396 bridges and 116 underpasses. The speed limit is 100 km/h (60 mph).

The five toll stations of the expressway are located in Yangon, Pyu, Nay Pyi Taw, Meik Htila and Mandalay. Toll range from 4500 kyats for cars to 22,500 Kyats for buses for the journey between Yangon and Mandalay. Container trucks are not allowed on the expressway.

The expressway was constructed by the Ministry of Construction and has mainly three phases which are Yangon – Nay Pyi Taw, Nay Pyi Taw – Mandalay and Mandalay (Saga-in) – Mandalay (Ta Gun Daing).

3.4.2 Speed Limitation by Type of Vehicle on Yangon - Mandalay Expressway

The following Table (3.1) represented the limitation of speed according to the type of vehicles on Yangon - Mandalay Expressway. The speed limitation was set in September, 2016. It is mainly divided into three major groups of vehicle type.

Table (3.1) Speed Limitation Chart by Type of Vehicles

Sr.	Type of Vehicle	Speed Limitation
1.	Truck (Heavy/ Light Truck/ Pick-up)	60 kilometer per hour
2.	Bus (Highway Express/Mini Bus)	90 kilometer per hour
3.	Private Owned Vehicle (Saloon/ Van/ SUV/ Sedan)	100 kilometer per hour

Source: Ministry of Construction, Department of Highways

Starting from September, 2016, the speed limitation was modified under the control of expressways law in accordance with the types of vehicle control the over speed driving as the rate of accidents on expressways have been increasing annually and gradually. Then, the expressways police has taken serious actions on the over speed driving vehicles. In order to be safe and free from road and traffic accidents along Yangon-Mandalay expressway, following expressway rules of over speed limitation is legalized by Ministry of Construction.

1. Express bus and mini-bus are not allowed to drive more than 90 kilometer per hour.
2. Up to 3 tons and under 3 tons medium and small truck (Light truck, mini pickup) are not allowed to drive more than 60 kilometer per hour.
3. The official passed lorry and heavy truck on expressways are not allowed to drive more than 60 kilometer per hour.
4. Private used cars such as saloon, van and station wagon are not allowed to drive more than 100 kilometer per hour.

3.5 Road Traffic Accidents on Yangon - Mandalay Expressway

In this section, Table (3.2) represents the number of road traffic accidents on Yangon – Mandalay expressway from 2012 to 2018. The highway police office was founded on 1st May, 2012 in order to supervise the accident cases and crimes occur on expressway. The statistics of road traffic accidents on expressway has recorded since the founding of highway police office.

Table (3.2) Road Traffic Accidents on Yangon-Mandalay Expressway

Months	Years							
	2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**Total**
January	-	10	23	21	57	36	41	188
February	-	23	40	17	47	25	36	188
March	-	21	44	38	70	57	33	263
April	-	25	60	52	69	65	44	315
May	2	29	40	34	73	47	37	262
June	12	17	29	35	59	46	40	238
July	16	28	27	40	80	50	28	269
August	14	27	26	40	70	40	38	255
September	7	19	26	37	50	34	44	217
October	17	20	35	44	58	65	45	284
November	14	18	29	53	61	45	48	268
December	21	22	33	42	50	45	40	253
Total	**103**	**259**	**412**	**453**	**744**	**555**	**474**	**3000**

Source: Highway Police Office (2019)

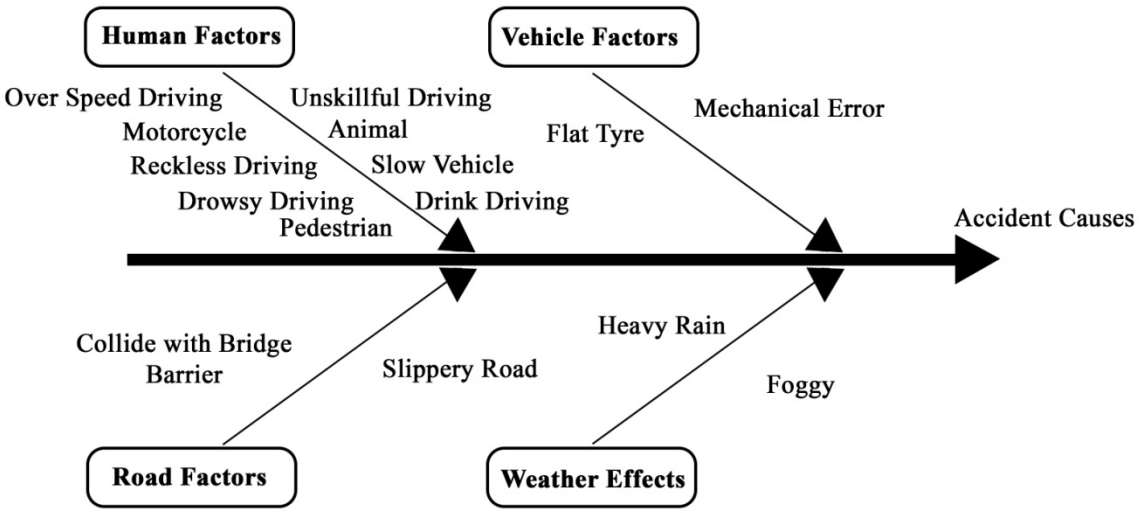
Table (3.2) expresses monthly traffic accidents on expressways from 2012 to 2018. Through having a check to those cases, the accidents has gradually increased starting from 2012 and 2016 was found out to be highest year of the accident. 25% of accidents were broken out in 2016 within those seven years. That's why, 2016 was regarded as the highest year of the death and blight cases on expressway. For those unpleasant cases, over speed vehicles have fined and tackled strictly and effectively to reduce the accidents starting from September, 2016. Then, it was resulted out the decreasing rate of accidents in following years 2017 and 2018. Having a look to

monthly occurrences, most of the accidents has occurred in April as it is the highest tour seasons in a year due to the long holidays. In April, 10% of the accidents are happened out of total 12 months in a year. October is the second highest month for accidents and 9.5% out of total cases. This is just because October is also the high tour season of a year as a month of Thadingyut Festival. As January and February are the exam season in nationwide, so that there is less travel activities and those months have the lowest rate of the accidents. Therefore, it is found out that the more or fewer rates of accidents is directly proportional to the more or less frequency of travelling on Yangon – Mandalay expressway.

3.6 Types of Crashes on Yangon - Mandalay Expressway

According to highway police office, there are four major factors those affect the traffic accidents rate injuries, the drivers, the vehicle problem, road design and environmental effect. Each factor can be further analyzed into detail causes.

Figure (3.1) Factors Influencing Road Traffic Accidents on Expressway



Source: Own Compilation

The above causes of accidents or fish bone diagram shows the main factors and their sub-factors of causing road traffic accidents on Yangon - Mandalay expressway.

Major Factors of Road Traffic Accident on Expressway

On Yangon - Mandalay Expressway, it is found that the causes of accidents are mainly concerned with people's unawareness of traffic safety. Every year show that vehicle collisions and accidents on expressway due to human error is over half of the total accidents. Analyzing the causes of accident on expressway, it can be seen that major of accidents are over speed and negligent driving. According to statistics of highway police force office, over 75% of total accidents is caused by human error. Table (3.3) shows the causes of road traffic accidents on Yangon - Mandalay expressway from year 2012 to 2018.

Table (3.3) Factors of Road Traffic Accidents on Yangon-Mandalay Expressway

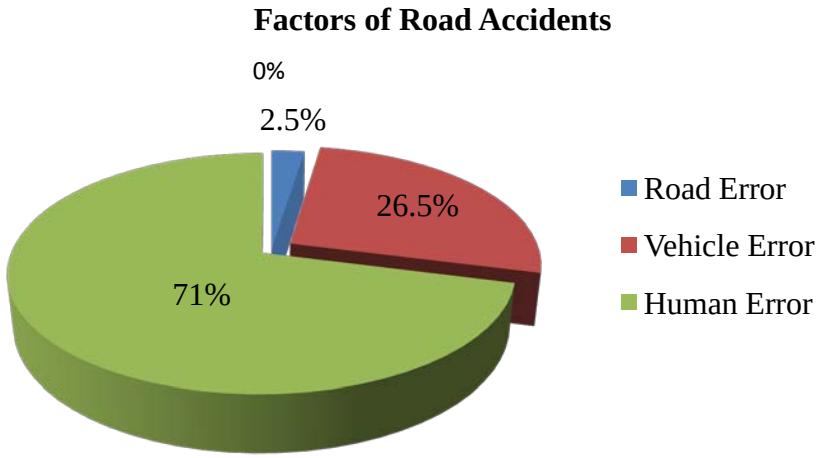
Years	Human Error		Vehicle		Road		Weather		Total
	No.	%	No.	%	No.	%	No.	%	
2012	88	85%	13	12%	2	1.9%	-	-	103
2013	220	85%	35	13.5%	3	1.2%	1	1.2%	259
2014	336	81.5%	71	17%	1	0.2%	4	0.2%	412
2015	381	84%	69	15%	3	0.7%	-	-	453
2016	528	71%	197	26.5%	19	2.5%	-	-	744
2017	389	70%	161	29%	5	1%	-	-	555
2018	367	77%	98	20%	9	1.9%	-	-	474
Total	**2309**	**-**	**644**	**-**	**42**	**-**	**5**	**-**	**3000**

Source: Highway Police Office (2019)

In Table (3.3), factors which cause road traffic accident on expressway are classified into four major factors. Road traffic accidents due to human's misbehaviour is major circumstance among four factors with average of over 75% of the total accidents. Accidents cause by vehicle follow as second factor with percentage between 21%. Factors affect due to road error and environmental, contribute a very small percentage as average about 1.3% and 0.2% respectively. The analysis of these characteristics point out the fundamental causes of major accidents and problems on

expressway. Figure (3.2) categorize the factors of road accidents based on year 2016 which is the most accident causes at 744 in total.

Figure (3.2) Categorizing the Factors of Road Accidents (2016)



Source: Table (3.3)

In Figure (3.2), it can be found that factors which cause road traffic accident on expressway in 2016 are shown into percentage. Road traffic accidents caused by human misbehave is about 71% of the total accident in this year. It plays as a major factor and is over half of the total accident in 2016. Accidents caused by vehicle error are accompanied as second major factor which are about 26.5% of the total accident. Accidents caused by road error are very low and is 2.5% of total accident. The crucial point comes out that safety preventive activities on expressway should focus on changing human's attitude and behaviour. Thus, it is needed to emphasize on giving priority to educate and notify the awareness of drivers on Yangon - Mandalay expressway.

3.6.1 Road Traffic Accidents Based Upon Human Factor

Among the main causes of road traffic accidents on expressway, human factor takes the first place. The factors for the drivers' accident commitments from the year 2012 to 2018 are shown in following Table (3.4).

Table (3.4) Road Traffic Accidents Caused by Human Factor

Human Factors	Years							
	2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**Total**
Over speed Driving	46	127	188	238	293	153	177	1222
Causes by Motorcycle	7	16	41	55	103	81	63	366
Reckless Driving	9	33	47	43	60	59	61	312
Drowsy Driving	-	15	28	22	56	74	63	258
Causes by Pedestrian	23	21	14	21	9	22	3	113
Unskillful Driving	1	3	12	-	-	-	-	16
Causes by Animal	1	4	4	1	5	-	-	15
Causes by Slow Vehicle	-	-	2	1	2	-	-	5
Drink Driving	1	1	-	-	-	-	-	2
Total	**88**	**220**	**336**	**381**	**528**	**389**	**367**	**2309**

Source: Highway Police Office (2019)

Among the factors that caused road traffic accidents on expressway, human error has the highest accidents from 2012 to 2018, totaling 2309 accidents shown in previous Table (3.3). Therefore, Table (3.4) shows the road traffic accidents on the expressway based on human factors, are divided into nine factors. Most of the road traffic accidents are occurred by drivers those who are driving over the recommended speed. The speed limit on the expressway is set up depending on the type of vehicle - 100 km per hour for the private use vehicle such as sedan, saloon and van type, 90 km per hour for highway express bus and 60 km per hour for light truck, heavy truck and mini pick-up. Traffic accidents and severe injuries are caused by the over speed driving, which is about 53% of the total accidents occurred by human factors in seven years on Yangon - Mandalay expressway. The secondary accident causes are occurred by the motorcycles which are not allowed to ride on expressway. Total 366 accidents are committed by the motorcycles, in which the percentage share of that is reached 16% out of total. Driving motorcycles and slow vehicles such as bicycle, trishaw and animal cart on the expressway is illegal action and strongly prohibited by expressways

law. Reckless driving is one of the major moving traffic violations and is placed on the third position of accident causes on expressway. It is usually a more serious offense than careless driving, improper driving, or driving without due care. It shares the percentage of 13.5% out of total accidents by this factor. The fourth is drowsy driving which means the dangerous combination of driving and sleepiness or fatigue. This usually happens when a driver has not slept enough, but it can also happen due to untreated sleep disorders, medications, drinking alcohol, or shift work. About 11% of total accidents on expressway are due to drowsy driving. The rest of accidents are caused by other reasons such as unskillful driving, hangover driving, occurred by pedestrian, animals and slow vehicles, that those altogether share 6.5% as small amount of percentage of total accidents by human factors.

3.6.2 List of Vehicles Taken Action for Over Speed Exceeding on Expressway

Table (3.5) reveals the numbers of vehicle being tackled by highway police due to over speed driving on expressway. The table is grouped according to the speed limitation by type of vehicles.

Table (3.5) Vehicles Taken Action due to Over Speed Exceeding

Years	Type of Vehicles				
	Light Truck	Heavy Truck	Express Bus	Private Vehicle	Total
2016	324	92	277	5430	6123
2017	6011	837	651	9218	16717
2018	8648	943	1311	5393	16295
Total	**14983**	**1872**	**2239**	**20041**	**39135**

Source: Highway Police Office (2019)

Note: 2016 - From September to December

Starting from 1st September, 2016, over speed vehicles on expressway are fined and tackled for 50000 MM Kyats. In accordance with the above Table (3.5), there are list of vehicles which are fined from September, 2016 to December, 2018. Among four groups of vehicles type, private used vehicles are the most fined and tackled. Within three years, more than half of the vehicles are private used ones, 51% out of total. The private used vehicles are the most over speed group than the rest. Next

to it is light truck, percentage shared 38%. According to the expressway law, they are not allowed to drive more than 60 km per hour. The express vehicles stand in the 3rd place as 5.7% of total. This is because nearly 90% of express vehicles on highway are controlled by Telematic system in order not to drive over speed. The control center of Telematic system is situated in the highway police office, Nay Pyi Taw and that center always operates on time. The speed limit for express bus is 90km per hour. The last group is heavy truck group and just 4.8% are resulted out. This result occurs as there is only a few number of heavy truck use expressway and most of them are using Yangon-Mandalay old highway.

3.6.3 Road Traffic Accidents Based Upon Vehicle Situations

Table (3.6) shows the vehicle error and road traffic accidents relationship. This cause of accidents is second major problem on Yangon - Mandalay expressway. Accidents occurred due to vehicle malfunction can be generally involved two type - tyre failure and mechanical disorder.

Table (3.6) Road Traffic Accidents Caused by Vehicle Malfunction

Vehicle Malfunction	Years							
	2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**Total**
Tyre Failure	10	20	53	62	176	137	81	539
Mechanical Disorder	3	15	18	7	21	24	17	105
Total	**13**	**35**	**71**	**69**	**197**	**161**	**98**	**644**

Source: Highway Police Office (2019)

Table (3.6) reveals the number of accident causes by vehicle malfunction on Yangon - Mandalay expressway for the year 2012 to 2018. There were only 13 accidents in 2012 and it was peak in 2016 which is total in 197 accidents. Then, the accidents were decreasing in the rest of two years. In the two types of accident involvement, accidents occurred by vehicle tyre failure plays as crucial problem. This type of accident share reached 83.5% of total accident. There were four major causes of tyre failure: over-inflation, under-inflation, wear and overloading of vehicles. Tyres fail on the road, because most of drivers those drive on highway are not familiar with

tyre information and they are lack of knowledge to check tyre condition before driving on highway road. The number of accidents due to vehicle mechanical disorder is only 105 of total accident in 7 years. It shares 16.5% of total accident due to vehicle failure. Mechanical disorder can be comprised vehicle suspension problem and engine problem. Thus, drivers should do monthly maintenance of their vehicles or check overall vehicle condition before making a trip.

3.6.4 Road Traffic Accidents Based Upon Road Conditions and Weather Effects

The relationship between traffic accidents and road and weather condition during the period from 2012 to 2018 is shown in Table (3.7). These are third and fourth causes of accident on Yangon - Mandalay expressway.

Table (3.7) Road Traffic Accidents Caused by Road and Weather Factor

Road Factor	Years							
	2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**Total**
Slippery Road	2	3	1	2	19	4	9	40
Collide with bridge barrier	-	-	-	1	-	1	-	2
Accidents Due to Weather	-	1	4	-	-	-	-	-
Total	**2**	**4**	**5**	**3**	**19**	**5**	**9**	**47**

Source: Highway Police Office (2019)

Poor- quality road design, construction and maintenance also contribute to road crashes problems. In this regard include poor road surface quality, deficient road signs and markings, limited or no lighting outside of urban areas and poor traffic control and safety. According to highway police office statistic, the number of accidents due to road condition is represented in Table (3.7). There were very few accidents caused by road network factor which was only 42 actions in 7 years. The most causes of accidents were due to slipping the road while driving on expressway. It shares about 95% of total accident committed by road factor. Colliding with bridge

barrier shares only 5%. Road traffic accidents due to road factor were only 42 actions which was 1.4% comparing to the total number of accidents in 7 years. The accidents due to weather condition are the least cases ever out of total. The vehicle straggled and the unclear view are the main causes which were happened when weather conditions were bad such as raining heavily and foggy. Ranging from 2012 to 2018, there was only 5 accident cases (0.16%) comparing to total 3000 cases

3.7 Accidents Resulting Deaths and Injuries on Yangon - Mandalay Expressway

The numbers of traffic accidents on expressway resulting deaths and injuries by gender from year 2012 to 2018 were presented in Table (3.8).

Table (3.8) Number of Deaths and Injuries by Gender

Years	Causes	Deaths			Injuries		
		Male	Female	Total	Male	Female	Total
2012	103	43	14	57	121	65	186
2013	259	81	32	113	342	280	622
2014	412	114	43	157	487	279	766
2015	453	83	41	124	620	413	1033
2016	744	107	63	170	782	522	1304
2017	555	86	30	116	482	381	863
2018	474	69	34	103	493	391	884
Total	**3000**	**583**	**257**	**840**	**3327**	**2331**	**5658**

Source: Highway Police Office (2019)

Table (3.8) describes the deaths and injuries due to road traffic accident on Yangon - Mandalay expressway from year 2012 to 2018. It is found out that more than half of the death persons and victims of the car accidents are males comparing to females in those 7 years. This is just because nearly all of the express vehicle's drivers are men and women rarely drove when they travelled to far places even on private trip. The list of death person has steadily increased from 2012 and the highest situation was in 2016. However, there was a slow receding rate of deaths and

accidents were occurred because the speedometer was randomly installed along the expressway and recorded the over speed vehicles, then fined and tackled effectively. Moreover, there is another reason that both the drivers and the passengers are used to the habit of wearing seat belts.

CHAPTER IV
SURVEY ANALYSIS AND FINDINGS

4.1 Survey Profile

The Yangon–Mandalay Expressway is an only expressway in Myanmar that connects the country's largest city Yangon, Capital Nay Pyi Taw and second largest city Mandalay. The expressway was opened in December 2010 and 587 km (365 mile) long. Expressway has reduced the travel time between Yangon and Mandalay to 7 hours from 13 hours by train and from 16 hours by the old highway.

The five toll stations of the expressway are located in Yangon, Pyu, Nay Pyi Taw, Meik Htila and Mandalay. Toll fees range from 4500 Kyats for small cars to 22,500 Kyats for buses for the journey between Yangon and Mandalay. Container trucks are not allowed on the expressway. The expressway was constructed by the Ministry of Construction and has mainly three phases.

Table (4.1) Phases of Yangon - Mandalay Expressway

Yangon – Nay Pyi Taw	– Construction period: October 2005 – March 2009 – Opened: 25 March 2009 – Track length: 325 kilometers (202 mi) – Number of bridges over 60 meters (200 ft): 40
Nay Pyi Taw – Mandalay	– Construction period: 2007 – December 2010 – Opened: 29 March 2010 – Track length: 240 kilometers (149 mi) – Number of bridges over 60 meters (200 ft): 32
Mandalay (Saga-in) – Mandalay (Ta Gun Daing)	– Construction period: 2010 – December 2011 – Opened: 30 December 2011 – Track length: 21.7 kilometres (13.5 mi) – Number of bridges over 60 metres (200 ft): 7

Source: Ministry of Construction, Department of Highways

4.2 Survey Design

The survey questionnaire data were collected on second weekend of February, 2019 at the restaurants and food courts of 39th miles and 115th miles rest camp terminals of Yangon-Mandalay Expressway from 9am to 3pm by interviewing the highway bus drivers, private car drivers and company car drivers with structured questionnaires.

Table (4.2) Number of Selected Restaurants and Sample Size

Selected Restaurants and Tea Shops	Daily Average Range of Car Stopping	Mean	Sample Size
Tha Pyay Yeik Tea Shop	700 - 1000	850	35
Feel Restaurant (39th mile)	300 - 500	400	17
Pioneer Restaurant	1200 - 1500	1400	58
Shwe Kha Yar Gyi Tea Shop	700 - 800	750	32
Feel Restaurant (115th mile)	1200 - 1500	1400	58
Total	**-**	**4800**	**200**

Source: Survey Data (2019)

Table (4.2) shows the number of selected restaurants and tea shops at 39th mile and 115th mile rest terminals and selected sample size of each restaurant. By using systematic sampling method, 35 respondents and 17 respondents out of total were selected from Tha Pyay Yeik tea shop and Feel restaurant at 39th mile rest terminal. At 115th mile rest terminal, each of 58 respondents was selected from Pioneer restaurant and Feel restaurant and 32 respondents were from Shwe Kha Yar Gyi tea shop. Total number of sample drivers was 200 and total restaurant selected at 2 at 39th mile rest terminal and 3 at 115th mile rest terminal.

The study is undertaken to find out the drivers' awareness and driving behaviours on road safety by using qualitative research method based on primary and secondary data. The questionnaires are divided into three parts. The first portion of the questionnaires is asked for demographic factors and driving experiences on

expressway of drivers. The second portion of the questionnaires is about the awareness of drivers on road safety and the last part of questionnaires is about the behaviours of drivers on road safety. For this study, a sample of 200 drivers were randomly chosen using systematic sampling method from the cars passing the restaurants and food courts of 39th miles and 115th miles rest terminals of Yangon-Mandalay Expressway from 9am to 3pm on second weekend of February.

4.3 Survey Results

The Table (4.3) represents the characteristic of respondents of this survey data which are separated into the socio-demographic of respondents and drivers' experience of driving on expressway.

Table (4.3) Characteristics of Respondents

Description		Respondents	Percentage
Gender	Male	187	93.5
	Female	13	6.5
Age Range	20-35	55	28
	36-50	114	57
	Above 50	31	15
Education Level	Middle school	10	5
	High school	80	40
	University Student	13	6.5
	Graduate	97	48.5
Frequency of Driving on Expressway	Under 10 times	46	23
	Bet; 10-20 times	46	23
	Above 20 times	108	54
License Categories	B (Kha)	89	45
	D (Gagyi)	42	21
	E (Nga)	69	34

Source: Survey Data (2019)

According to Table (4.3), 93.5%, 187 people are male and the rest 6.5%, 13 are female. Among 200 respondents, 28% are between 20-35 ages, 57% are 36-50 years old and 15% of the respondents are above 50 years old. By analyzing the education level of respondents, most of the drivers, 97 respondents are the graduated. Second to the position is the high school level respondents which is 80 out of total. Next, 10 respondents are the middle school education level. Nearly all of the express bus and light truck drivers are middle and high school education level, but there are some graduated persons also can be counted in that career. The university education level respondents are 13 persons out of total 200 respondents. The respondents who have driving frequencies on expressway less than 10 times and between 10 to 20 times are 46 respectively. There are 108 respondents who have more than 20 times experience. It is mentioned about the license categories of 200 respondents. 89 respondents, 45% of them hold (B) level license and it is the highest percent comparing to the rest. Next to it, (C) level license holder shares 34%, 69 respondents out of total 200. (D) Level license holders are just 42 persons and 21 in percentage, the least proportion of the survey data.

Table (4.4) Driving Years of the Respondents on Expressway

Driving Years on Expressway	Respondents	Percent
1	31	16
2	16	8
3	29	15
4	19	9
5	28	14
6	13	6
7	15	7
8	17	9
9	10	5
10	22	11
Total	**200**	**100**

Source: Survey Data (2019)

Table (4.4) is about the length time of driver's experience relating to expressway. It is ranging from 1 - 10 years. Although 16 % of them have less than 1 year driving, it is found out that more than half of the drivers have over 5 years driving length time. However, the frequency of expressway driving experiences can offer more accurate results than the expressway driving length time period. Some drivers answered that they have been driving 3 years on expressway though they just drove once a year. But some answered that it has been just 2 years and they have been driving several times within 2 years. Therefore, doubtlessly, expressway experiences is directly and proportionally relating to the frequency of expressway driving rather than the expressway driving length time.

Education Level of Respondents and Types of Vehicle

Table (4.5) is expressed about the education level of the respondents and types of vehicle. In order to show that most of the lower education level respondents are rental driver, light truck and express bus driving person, those who are most likely to be lack of awareness on traffic rules and have bad behaviour basically.

Table (4.5) Relation between Education Level of Drivers and Types of Vehicle

Education Level	Types of Vehicle			
	Private or Rental Vehicle	Light Truck	Express Bus	Total
Middle School Level	2	6	2	10
High School Level	43	1	36	80
University Level	9	-	4	13
Graduate	94	1	2	97
Total	**148**	**8**	**44**	**200**

Source: Survey Data (2019)

The education level is classified into 4 types; middle school level, high school level, university level and graduates. For types of vehicle, based on speed limited rates on the expressway, it is divided into 3 types; private or rental vehicle, light truck or mini pickup and express bus. Private or rental vehicles, such as saloon and van are allowed to drive 100 kilometer per hour on expressway. However, express buses and light trucks are permitted to drive 90 kilometer and 60 kilometer per hour

respectively. It is resulted that most of the middle school education level are light truck drivers, there were some express bus drivers are included in the respondents. Private or rental vehicles and express bus drivers are mostly high school education level people, 80 respondents out of 200 to be exact. There are some university level, 13 respondents in number who drives private or rental vehicles and express buses. Among all respondents, nearly half of the respondents are graduates and those 94 persons are private or rental vehicles' drivers. But, there was 1 light truck driver and 2 express bus drivers in the graduate group.

In accordance with survey data, most of the drivers, 108 persons, 54% out of total have more than 20 times experiences driving on expressway. Secondly, 23% of them just have experiences between 10 to 20 times. So, the overview result is that most of them have many experiences in driving on expressway. It is resulted out that 20 respondents out of 200 had have an accident on expressway while driving on it. Generally, on analysis of this study, survey data results are divided into 3 parts; drivers' awareness based on the education level of a driver, driving behaviours depended on the types of vehicles of drivers and the suggestion and comments of driver derived from the expressway driving experiences.

4.3.1 Relation between Drivers' Awareness on Road Safety and Respondents' Characteristics

In this section, the relation of driving awareness of 200 respondents and their personal characteristics will be mentioned in detail. Likert scale question format is constructed to select data for this topic. In general, the driving awareness can be classified into six forms; the awareness on risky overtaking, the awareness on overloading, the awareness on over speeding, the awareness on drinking alcohol, the awareness on wearing seat belt and the awareness on using mobile phone while driving.

Drivers' Awareness on Risky Overtaking

Table (4.6) is expressed about the relation between drivers' awareness on risky overtaking and their age range group, education level, driving frequency and types of vehicle they drive on expressway.

Table (4.6) Relation between Drivers' Awareness on Risky Overtaking and Respondents' Characteristics

Description			SD	D	N	A	SA	Mean Score
			%	%	%	%	%	
Drivers' Awareness on Risky Overtaking on Expressway	Age range	20 - 35	5	10	18	47	20	3.5
		35 - 50	3	5	9	74	9	4
		Above 50	0	0	10	80	10	4.5
	Education level	Middle school	0	30	40	30	0	2.9
		High school	3	10	8	49	30	3.9
		University education level	0	8	8	22	62	4.3
		Graduate	4	3	3	64	26	4.0
	Frequency of driving on expressway	Under 10 times	6	18	26	35	15	3.3
		10 - 20 times	6	5	24	33	32	3.9
		Above 20 times	0	11	14	56	19	4.1
	Types of vehicle	Private or rental vehicle	4	21	17	32	26	3.5
		Light truck	0	25	15	46	14	3.8
		Express bus	0	13	8	46	33	4.1

(SD: Strongly Disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly Agree) Source: Survey Data (2019)

In Table (4.6), the relation between drivers' awareness and the characteristics of respondents on risky overtaking is analyzed. In this table, only the essential characteristics such as age, education, type of vehicles and frequency of driving on expressway are taken. The question is about that it is dangerous to do overtaking at bridges or bending part of expressway. It is found that, on the age difference, the youngest group has least awareness on risky overtaking while over 50 years of age has the strong awareness on it. Then, for education level, middle school level group has the least and graduates have the highest awareness on risky overtaking. Moreover, it is found that the frequency on driving expressway is directly proportional to the

awareness of drivers. For drivers' awareness based on types of vehicles, most of the private car owners have lower awareness than that of express bus drivers.

Drivers' Awareness on Vehicle Overloading

Table (4.7) describes about the relation between drivers' awareness on vehicle overloading and their age range group, education level, driving frequency and types of vehicle they drive on expressway.

Table (4.7) Relation between Drivers' Awareness on Vehicle Overloading and Respondents' Characteristics

Description			SD	D	N	A	SA	Mean Score
			%	%	%	%	%	
Drivers' Awareness on Vehicle Overloading on Expressway	Age range	20 - 35	0	6	13	68	13	4
		35 - 50	0	3	8	78	11	4.3
		Above 50	0	10	4	68	18	4.4
	Education level	Middle school	0	10	20	60	10	3.7
		High school	0	6	6	40	48	4.3
		University education level	0	0	15	54	31	4.1
		Graduate	0	3	5	46	46	4.4
	Frequency of driving on expressway	Under 10 times	0	6	9	56	29	4.2
		10 - 20 times	0	4	11	52	33	4.2
		Above 20 times	0	4	8	53	34	4.3
	Types of vehicle	Private or rental vehicle	0	2	12	47	38	4.2
		Light truck	0	37	25	25	12	3.5
		Express bus	0	7	5	60	28	4.3

(SD: Strongly Disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly Agree) Source: Survey Data (2019)

Table (4.7) represents the relation between characteristics of respondents and their awareness on vehicle overloading. Over viewing this table, all age group have awareness in terms of vehicle overloading. However, in accordance with education level, middle school education level drivers have less awareness on vehicle overloading comparing to others. And also, most of the middle school education level respondents are light truck drivers and light truck vehicle group commits and do over loading rather than the rest vehicle group. Last but not least, the more or the less experience on expressway driving, nearly all have got awareness on vehicle overloading.

Drivers' Awareness on Over Speed Driving

Table (4.8) represents about the relation between drivers' awareness on over speed driving and their age range group, education level, driving frequency and types of vehicle they drive on expressway.

Table (4.8) Relation between Drivers' Awareness on Over Speed Driving and Respondents' Characteristics

Description			SD	D	N	A	SA	Mean Score
			%	%	%	%	%	
Drivers' Awareness on Over Speed Driving on Expressway	Age range	20 - 35	4	15	18	60	3	3.8
		35 - 50	1	3	31	58	7	4
		Above 50	0	2	4	70	24	4.4
	Education level	Middle school	0	0	0	90	10	4.1
		High school	2	3	2.5	42	48	4.3
		University education level	0	0	0	38	62	4.6
		Graduate	1	4	8	52	35	4.1
	Frequency of driving on expressway	Under 10 times	5	15	19	32	29	3.7
		10 - 20 times	2	12	16	46	24	3.9
		Above 20 times	0	7	15	51	27	4
	Types of vehicle	Private or rental vehicle	2	11	14	45	28	3.9
		Light truck	0	25	37	25	12	3.5
		Express bus	0	9	16	41	34	4.1

(SD: Strongly Disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly Agree) Source: Survey Data (2019)

According to the Table (4.8), it is described the characteristics of 200 respondents and their awareness on over-speeding when driving on expressway. Based on the age group, the youngest age group are the most likely to have awareness on over-speeding which can lead to traffic accidents. But all have got strong awareness on over-speeding based on education level. Comparing to the frequency of driving times on expressway, the respondents who have more experiences driving have got more awareness than less ones. The light truck group has the least awareness while express bus vehicle group has got the highest awareness on over-speeding. It can be suggested that private car has got relative awareness on over-speeding too.

Drivers' Awareness on Wearing Seat Belt

Table (4.9) represents about the relation between drivers' awareness on wearing seat belt and their age range group, education level, driving frequency and types of vehicle they drive on expressway.

Table (4.9) Relation between Drivers' Awareness on Wearing Seat Belt and Respondents' Characteristics

Description			SD	D	N	A	SA	Mean Score
			%	%	%	%	%	
Drivers' Awareness on Wearing Seat Belt on Expressway	Age range	20 - 35	0	0	5	45	50	4.2
		35 - 50	0	0	3	66	31	4.3
		Above 50	0	0	3	34	63	4.6
	Education level	Middle school	0	0	0	50	50	4.5
		High school	0	0	4	38	57	4.5
		University education level	0	0	0	23	77	4.7
		Graduate	0	0	4	57	39	4.3
	Frequency of driving on expressway	Under 10 times	0	0	3	48	49	4.3
		10 - 20 times	0	0	4	52	44	4.6
		Above 20 times	0	0	4	43	53	4.5
	Types of vehicle	Private or rental vehicle	0	0	3	49	48	4.4
		Light truck	0	0	12	75	13	4
		Express bus	0	0	5	70	25	4.2

(SD: Strongly Disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly Agree) Source: Survey Data (2019)

Relating to wearing seatbelt, it is so obvious that all the respondents have awareness on it according to Table (4.9). Furthermore, the total score of all the factors are above or around 4. So, it is just because of the government serious action and fine on this practice to have.

Drivers' Awareness on Using Mobile Phone While Driving

Table (4.10) expresses about the relation between drivers' awareness on using mobile phone and their age range group, education level, driving frequency and types of vehicle they drive on expressway.

Table (4.10) Relation between Drivers' Awareness on Using Mobile Phone and Respondents' Characteristics

Description			SD	D	N	A	SA	Mean Score
			%	%	%	%	%	
Drivers' Awareness on Using Mobile Phone While Driving on Expressway	Age range	20 - 35	5	7	7	40	41	4.4
		35 - 50	1	5	5	60	31	4.2
		Above 50	3	3	6	71	17	4
	Education level	Middle school	0	10	30	60	0	3.5
		High school	4	7	5	40	44	4.1
		University Student	0	0	0	46	54	4.5
		Graduate	2	4	5	49	39	4.2
	Frequency of driving on expressway	Under 10 times	2	4	13	71	10	4.2
		10 - 20 times	2	4	15	44	35	4.1
		Above 20 times	3	6	9	40	43	4.3
	Types of vehicle	Private or rental vehicle	3	5	10	60	22	4.2
		Light truck	13	25	37	25	0	2.9
		Express bus	0	2	7	50	41	4.3

(SD: Strongly Disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly Agree) Source: Survey Data (2019)

In Table (4.10), it is found that all age group have a relative awareness of using mobile phone when driving on expressway. However, in term of education level, middle school education level has less awareness than that of other groups and their related types of vehicle, light truck vehicles are less likely to think of that it is very dangerous to talk on phone while driving. But express bus driver have strong awareness on using mobile phone.

Drivers' Awareness on Drink Driving

Table (4.11) represents about the relation between drivers' awareness on drink driving and their age range group, education level, driving frequency and types of vehicle they drive on expressway.

Table (4.11) Relation between Drivers' Awareness on Drink Driving and Respondents' Characteristics

Description			SD %	D %	N %	A %	SA %	Mean Score
Drivers' Awareness on Drink Driving on Expressway	Age range	20 - 35	5	22	27	33	15	3.3
		36 - 50	2	11	23	41	23	3.7
		Above 50	0	10	13	45	32	4.0
	Education level	Middle school	0	10	30	60	0	3.5
		High school	4	7	5	40	44	4.1
		University education level	0	0	8	40	52	4.5
		Graduate	2	4	5	49	39	4.2
	Frequency of driving on expressway	Under 10 times	5	9	20	42	24	3.9
		10 - 20 times	5	9	16	39	30	3.8
		Above 20 times	1	11	13	39	35	3.9
	Types of vehicle	Private or rental vehicle	3	12	24	39	22	3.7
		Light truck	13	13	37	25	12	3.8
		Express bus	0	5	9	57	29	4.0

(SD: Strongly Disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly Agree) Source: Survey Data (2019)

Table (4.11) represents the relation between characteristics of respondents and their awareness on drink driving when they are driving on expressway. The awareness on drunk driving is not directly related to the driving frequencies though. Among three age groups, the youngest group has the least awareness on drink driving and for education level, the middle school education level has got least too. Based on types of vehicles, express bus driver has the highest awareness while private type has got the least.

4.3.2 Relation between Drivers' Behaviour and Respondents' Characteristics

In previous section, the relation of driving awareness of 200 respondents and their personal profile were mentioned in detail. According to the data, it was found out that the driving behaviours of the drivers is also depend on their age range, educational level, their driving frequencies on expressway and type of cars they drive. Here also, like the previous section, the driving behaviour can be classified into six forms; the driving behaviour of risky overtaking, the behaviour of overloading, the behaviour of over speed driving, the behaviour of drunk driving, the behaviour of wearing seat belt and the behaviour of using mobile phone while driving.

Driving Behaviour of Risky Overtaking

Table (4.12) expresses about the relation between drivers' behaviour of risky overtaking and their age range group, education level, driving frequency and types of vehicle they drive on expressway.

Table (4.12) Relation between Drivers' Behaviour of Risky Overtaking and Respondents' Characteristics

Description			SD	D	N	A	SA	Mean Score
			%	%	%	%	%	
Drivers' Behaviour of Risky Overtaking on Expressway	Age range	20 - 35	36	29	9	22	4	2.3
		35 - 50	11	69	5	13	2	2.2
		Above 50	45	26	10	19	0	2
	Education level	Middle school	30	20	20	10	20	2.7
		High school	39	38	7	15	1	2.0
		University education level	38	32	15	15	0	2.0
		Graduate	8	69	4	19	0	2.3
	Frequency of driving on expressway	Under 10 times	35	26	9	26	4	2.6
		10 - 20 times	30	23	15	30	2	2.5
		Above 20 times	16	74	3	7	0	2
	Types of vehicle	Private or rental vehicle	26	46	7	19	2	2.3
		Light truck	38	50	12	0	0	1.8
		Express bus	14	70	7	9	0	2

(SD: Strongly Disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly Agree)

Source: Survey Data (2019)

According to the above table (4.12), it is described the characteristics of 200 respondents and their behaviour of risky overtaking when driving on expressway. The lesser the total mean score, the lesser the potential to do overtaking. Due to the data in above table, the youngest age group, between 20-35 has the mostly done such kind of behaviour rather than other age group. The middle school education level group has resulted out such behaviour and based on frequency of driving expressway, under 10 times group, not very experienced ones are more likely to commit risky over taking comparing to others. And for different types of vehicle, private or rental small vehicle type do risky overtaking most among others.

Drivers' Behaviour of Vehicle Overloading

Table (4.13) describes about the relation between drivers' behaviour of vehicle overloading and their age range group, education level, driving frequency and types of vehicle they drive on expressway.

Table (4.13) Relation between Drivers' Beahaviour of Vehicle Overloading and Respondents' Characteristics

Description			SD %	D %	N %	A %	SA %	Mean Score
Drivers' Behaviour of Vehicle Overloading on Expressway	Age range	20 - 35	42	35	16	7	0	1.9
		35 - 50	40	51	6	3	0	1.7
		Above 50	39	29	29	3	0	1.8
	Education level	Middle school	60	0.0	20	20	0	2
		High school	56	31	10	3	0	1.6
		University education level	46	31	15	8	0	1.8
		Graduate	25	56	13	6	0	2.3
	Frequency of driving on expressway	Under 10 times	37	46	13	4	0	1.8
		10 - 20 times	28	43	22	7	0	2
		Above 20 times	47	42	8	3	0	1.7
	Types of vehicle	Private or rental vehicle	31	50	14	5	0	1.9
		Light truck	25	50	25	0	0	1.7
		Express bus	75	20	5	0	0	1.3

(SD: Strongly Disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly Agree) Source: Survey Data (2019)

The presented Table (4.13) is depicted the relation between whether the driver has behaviour of overloading or not based on the survey data result. The survey result indicates that the lesser the total mean score of that answer, the lesser to have such kind of bad practice of driver. The youngest age group has got a little bit of higher overloading behaviour than that of the rest. However, the middle school education level and the graduates have the good behaviour of overloading. It is found that private or rental small vehicle has carried overloaded most when express bus drivers commit it least.

Drivers' Behaviour of Over Speed Driving

Table (4.14) represents about the relation between drivers' behaviour of over speed driving and their age range group, education level, driving frequency and types of vehicle they drive on expressway.

Table (4.14) Relation between Drivers' Behaviour of Over Speed Driving and Respondents' Characteristics

Description			SD %	D %	N %	A %	SA %	Mean Score
Drivers' Behaviour of Over Speed Driving on Expressway	Age range	20 - 35	22	33	16	24	5	2.6
		35 - 50	15	58	14	11	2	2.3
		Above 50	32	45	0	23	0	2.1
	Education level	Middle school	30	20	20	20	10	2.6
		High school	19	52	13	13	3	2.3
		University education level	15	23	31	23	8	2.8
		Graduate	20	53	9	18	0	2.3
	Frequency of driving on expressway	Under 10 times	33	26	17	20	4	2.4
		10 - 20 times	26	28	22	20	4	2.5
		Above 20 times	11	68	6	14	1	2.3
	Types of vehicle	Private or rental vehicle	20	45	12	19	4	2.4
		Light truck	13	25	25	38	0	2.8
		Express bus	18	66	11	5	0	2

(SD: Strongly Disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly Agree) Source: Survey Data (2019)

Table (4.14) shows the drivers' over-speeding behaviour on expressway. It is clear that the higher the total mean score in the table, the higher to commit such kind of actions in reality on expressway. The youngest group is the most likely to do over-speeding and like overloading behaviour, middle school education level and the graduates have that bad behaviour more as well. Overview to types of vehicles for this topic, light truck car are the most over-speeding vehicle on expressway because of

their limited speed is 60 miles per hour which means too slow for driving on expressway and at the same time, it is found out that express buses are the least doing over-speeding vehicle type.

Drivers' Behaviour of Wearing Seat Belt

Table (4.15) represents about the relation between drivers' behaviour of wearing seat belt and their age range group, education level, driving frequency and types of vehicle they drive on expressway.

Table (4.15) Relation between Drivers' Behaviour of Wearing Seat Belt and Respondents' Characteristics

Description			SD	D	N	A	SA	Mean
			%	%	%	%	%	Score
Drivers' Behaviour of Wearing Seat Belt on Expressway	Age range	20 - 35	0	2	10	35	53	4.4
		35 - 50	0	0	3	75	22	4.2
		Above 50	0	0	10	52	38	4.3
	Education level	Middle school	0	0	30	50	20	3.9
		High school	0	1	5	50	44	4.4
		University education level	0	0	15	38	47	4.3
		Graduate	0	0	5	73	22	4.2
	Frequency of driving on expressway	Under 10 times	0	2	9	54	35	4.2
		10 - 20 times	0	0	11	67	22	4.1
		Above 20 times	0	0	3	60	37	4.3
	Types of vehicle	Private or rental vehicle	0	1	6	57	36	4.3
		Light truck	0	0	12.5	75	12.5	4
		Express bus	0	0	4.5	70	25.5	4.2

(SD: Strongly Disagree, DA: Disagree, N: Neutral, A: Agree, SA: Strongly Agree) Source: Survey Data (2019)

Table (4.15) represents the relation of drivers' behviour of wearing seat belt and their profile. It is resulted out that nearly all of the respondents have the habit of wearing seat belts and they are willing to do it while driving on expressway. However, the total score of each age group has got nuanced result and only middle

education level is slightly lower score than that of the rest. Private or rental car drivers have the strongest awareness because their score is 4.3 and it is the highest among other types of vehicles. Express bus drivers accompanied as second highest score with 4.2 and they also have quite good behaviour of wearing seat belt. They have good practice because they have been trained by upgraded driving training class. Light truck drivers also have awareness to wear seat belt while driving on expressway. The habit of wearing seat belt is one of the successful actions of government mechanism.

Drivers' Behaviour of Using Mobile Phone While Driving

Table (4.16) represents about the relation between drivers' behaviour of using mobile phone and their age range group, education level, driving frequency and types of vehicle they drive on expressway.

Table (4.16) Relation between Drivers' Behaviour of Using Mobile Phone and Respondents' Characteristics

Description			SD	D	N	A	SA	Mean Score
			%	%	%	%	%	
Drivers' Behaviour of Using Mobile Phone While Driving on Expressway	Age range	20 - 35	27	25	29	16	3	2.4
		35 - 50	10	39	17	30	4	2.7
		Above 50	32	29	23	16	0	2.2
	Education level	Middle school	20	30	20	30	0	2.6
		High school	13	31	31	25	0	2.8
		University education level	38	31	15	8	8	2.2
		Graduate	21	38	13	26	2	2.5
	Frequency of driving on expressway	Under 10 times	33	39	22	6	0	2.0
		10 - 20 times	41	33	22	4	0	1.8
		Above 20 times	15	17	20	42	6	3.2
	Types of vehicle	Private or rental vehicle	18	26	24	30	2	2.7
		Light truck	0	25	37.5	37.5	0	3
		Express bus	2	64	7	4	0	1.9

(SD: Strongly Disagree, DA: Disagree, N: Neutral, A: Agree, SA: Strongly Agree) Source: Survey Data (2019)

In the format of survey question, the lesser the amount of total mean score, the lesser the behaviour of using mobile phone while driving on expressway. So, by analyzing the given above Table (4.16), 50 and above age group is the least mobile phone using group while middle and high school education level respondents use more mobile phone than others while driving. More than 30% of private and rental car drivers have the behaviour of using mobile phone. Here, the respondents who answer Neutral can be counted as using mobile phone while driving. Based on the type of vehicles, the express drivers rarely use mobile phone while driving but, one-third of the private or rental and light truck drivers has been founded to use mobile phone.

Drivers' Behaviour of Drink Driving

Table (4.17) represents about the relation between drivers' behaviour of drunk driving and their age range group, education level, driving frequency and types of vehicle they drive on expressway.

Table (4.17) Relation between Drivers' Behaviour of Drink Driving and Respondents' Characteristics

Description			SD	D	N	A	SA	Mean Score
			%	%	%	%	%	
Drivers' Behaviour Of Drink Driving on Expressway	Age range	20 - 35	18	18	40	24	0	2.6
		35 - 50	32	40	28	0	0	2.2
		Above 50	48	32	19	0	0	1.7
	Education level	Middle school	10	20	30	40	0	1.7
		High school	26	42	22	10	0	2.3
		University education level	24	38	38	0	0	2.0
		Graduate	48	36	15	1	0	2.3
	Frequency of driving on expressway	Under 10 times	17	37	33	13	0	2.4
		10-20 times	13	39	37	11	0	2.1
		Above 20 times	34	52	12	2	0	2.2
	Types of vehicle	Private or rental vehicle	29	50	12	9	0	2
		Light truck	13	74	13	0	0	2
		Express bus	39	57	4	0	0	1.7

(SD: Strongly Disagree, DA: Disagree, N: Neutral, A: Agree, SA: Strongly Agree) Source: Survey Data (2019)

In accordance with Table (4.17), most the young people have drink driving behaviour than that of elderly. It can suggest that some of graduates and higher education level have been found out such kind of inappropriate drink driving behaviour. However, there is no connection between drink driving and the experiences of expressway driving. Based on types of vehicles, 9% of rental and private small vehicles' drivers commit that they have drink driving behaviour.

4.3.3 Respondents' Perception on the Needy Facts or Upgrading Part of Expressway

Under this title, it is expressed the suggestion and perception of 200 respondents on the needy facts or need to be upgraded part of expressway in order to reduce traffic accidents and be a perfect road infrastructure. As those all data are collected one by one section, those suggestions and perceptions of the respondents are taken into consideration seriously because those are the voice of citizens what they are suffering in reality life.

Table (4.18) Suggestions of Respondents on Needy Situation of Expressway to be Upgraded

Description	Yes		No		Neither	
	Respondent	%	Respondent	%	Respondent	%
The need of more traffic signs and road marking	182	91	15	7.5	3	1.5
The perception of hard to see the road interchange or intersections and reflection signs	196	93	12	6	2	1
The remote distance between rest camps	3	1.5	191	95.5	6	3
The need of upgrading the surface of expressway	194	97	2	1	4	2

Source: Survey Data (2019)

The following table (4.18) is described about the perception and suggestion of drivers in order to upgrade expressway. According to the survey data, 91% of respondents answer that road marking and traffic signs, are need to be added more along expressway. Also, it is found out that 93% claimed that it is hard to see the road interchange or intersections and reflection signs in advance while driving on expressway. 97% are said to encourage continuous upgrading the expressway surface. Therefore, overview of this table can be suggested that current expressway is not qualified enough to be in one of the international expressway and still does not meet the international standard criteria, which means to be keep upgrading and maintaining to meet all those criteria and become one of them.

Table (4.19) Personal Perception of Respondents Relating to Situation of Expressway

Description	Related Answers	Respondent	Percentage
The hardest part to drive on expressway (more than one answer)	From Yangon toll gate to 39 mile rest camp	82	41
	From 39 mile rest camp to 115 mile rest camp	115	57.5
	From 115 mile rest camp to Nay Pyi Taw toll gate	44	22
	From Nay Pyi Taw toll gate to 285 mile rest camp	14	7
	From 285 mile rest camp to 366 Ta Kon Tine round about	60	30
Things or vehicles annoys on expressways (more than one answer)	Motorbike	179	89.5
	Sudden pedestrian	130	65
	Cart	35	17.5
	Animals (Dog, Cow, Goat)	96	48
	Vehicles do not stop aside	77	38.5
The priority facts to be safe and free from accidents (more than one answer)	Checking the car's conditions	172	86
	Not drinking beer and alcohol while driving	127	63.5
	Not driving more that limited speed	105	52.5
	Control not to be sleepy	104	52
	Wearing seatbelt	117	58.5

Source: Survey Data (2019)

Table (4.19) represents the priorities checklist in order to be safe and free from traffic accidents and hard part to drive relating to expressway based on the choice of respondents For selecting the hard pathways to drive on expressway, 82 respondents out of 200, 41% picked up that the part from Yangon toll gate to 39 mile rest camp is difficult to drive. More than half of the respondent 57.5%, 115 in person chose the part from 39th mile rest camp to 115th mile camp while the least selecting part, only 7% of the respondents' answer is from Nay Pyi Taw toll gate to 285 mile rest camp. Therefore, the hardest path on expressway to drive is from 39 mile to 115 mile rest camp.

And then, in accordance with survey data, there are so many things or facts which mainly annoy drivers when driving on expressway are as follow. Among 5 factors, 179 respondents answered that motorbikes are the most annoying things ever. Second most annoying facts next to motorbike are sudden road pedestrian 65%, 130 people in number when animals on expressway are placed in third place. The priority facts or checklist to do in order to be safe and free from accidents, checking the strength of vehicles' conditions stand in the first place with 86% in total. However, the respondents think that controlling not to be sleepy is the least priority things to do in order to be safe and free from traffic accidents, on driving the expressway.

CHAPTER V
CONCLUSION

5.1 Findings

Yangon-Mandalay expressway is important and strategic expressway which plays an essential role in speedy flow of goods and passengers in Myanmar. However, on the other hand, there has been terrible accidents and death on expressway nearly daily that people have been noticed of it. Therefore, the purpose of this study is, in order to be able to know which factors can cause or reinforce to happen those grievingly traffic accidents and to explore the awareness and behaviour of drivers on road safety especially when they are driving on expressway. So, this chapter is expressed the finding and some special factors which are result out and tracked from data collection.

Firstly, according to secondary data from the office of highway police which are already presented in Chapter (3), there are four main factors that can cause traffic accidents on expressway. They are human error, vehicle (machine) error, road error and bad weather conditions. Among them, human error (driver's error) is the main factors which can cause the vehicle crashes, accidents and the death of people. From May, 2012 to May 2018, 77% of the accidents, 2309 cases out of 3000 in number are happened on expressway because of human error (vehicle and road users) due to secondary data from expressway police.

Detailing human error factor, there are total 9 factors and as an example, caused by over-speeding, caused by motorbikes, reckless and drowsy driving. Out of 9 factors, over-speeding is the main factors comparing to the rest of human factor which is 53% and in numbers total 1222 cases. Second to that is caused by undisciplined motorbikes which are not permitted to drive on expressway, 366 cases, 16% is resulted out. Moreover, in accordance with the respondents' answer of Table (4.18), motorbikes are the most annoying things on expressway, 90% of the answer. Next, 13% is due to reckless driving.

Among four main accident cases, the second fact, vehicle error caused 664 accident cases and 22% out of total 3000 cases. Here, it can be divided into 2 parts, tyre blow-out and mechanic error. However, the third factor road slip has got very few percentage, same as bad weather conditions.

Again, overview monthly accident rates, April is the highest accident rate in every year, 15% of accident cases, comparing to the rest 11 months. This is just because as April is new year month and highest traveling month of the year. Next to April is the Thadingyut festival month, October. So, it is obvious that the rates of accident are higher in high travel season too.

In order to control and reduce gradual increasing accident rate, highway police has taken serious actions on over-speeding vehicles since September, 2016. From September, 2016 to December, 2018, it is found out that total 39135 is arrested and fined for over-speeding and the first most being fined and arrested are private or rental small vehicles type, 51% in 100%. In appendix 4, it is expressed the limited speed for each types of vehicle. Second most fined are light trucks which are only permitted to drive 60 kilometer per hour and it possess 43% out of 100%. Then, express buses and only 2239 buses in number.

Now, it is time to express the specialties and some unusual factors which are used to construct Tables in Chapter (4). In this chapter, the awareness and behaviour of drivers in terms of road safety is presented based on the different age group, education level, frequency of driving experience on expressway and their driving types of vehicles.

According to data result from Chapter (4), based on the difference age group, the youngest age group (20-35) has mostly less of awareness on over-speeding and they are more likely to do it than that of other elderly group. Based on vehicle type, private or rental small vehicles and light trucks are driving more than their limited speed. And for risky overtaking, the middle education level committed those behaviour most.

In drink driving section, small percentage of drivers of private and small vehicle type is in and if it looks from difference education level, it is found out that middle education level respondents are committing such behaviour too. For mobile phone using while driving on expressway, not surprisingly, light truck driver and middle education level are more likely to have such kind of behaviour. In case of

vehicle overloading, some light trucks drivers are assumed to do vehicle overloading behaviour.

However, for wearing seatbelts, nearly all have such kind of behaviour and it can be recognized as a strong behaviour. It is just because government has been started taken serious action and heavy fines on wearing seatbelts and later it is transformed into habit in every single driver.

Under perception section, survey question was constructed to be able to give opinions, suggestion on needy situation and their comments on expressway, and as expected, it is found out that most of the respondents' think of that expressway should be still needed to upgrade more. Needy facts like especially insufficient road marking, road signs, road reflections and road lamps at night and not smoothing parts of the road.

5.2 Recommendations

Based on the findings and survey result of this thesis, the central government and the respective organizations and institutions should implement more to be stronger and more perfect expressways which can bring in the wellbeing and sustainable benefits of Myanmar citizens. From having a look to road safety part, as there are so many over-speeding, government and expressway police has taken serious actions on it and on the other hand, it is needed to give and hold road safety education program in order to have awareness always and become the habits. It would be better to have some kind of barriers along expressway and also building underpass near villages or cities along expressway in order to reduce the traffic accidents which are caused by sudden animals and prohibited motorbikes and bicycles.

In order to get rid of bad behaviour like using mobile phone, overloading and drink driving which are resulted out from Chapter (4), spreading leaflets at toll gates and putting more billboards through expressway to promote awareness should be carried out. Moreover, driving licenses can be issued only to people who have reached prescribed age, are physically and psychologically able to drive vehicles, have gone through the prescribed education and training, have demonstrated ability to drive vehicles and have fulfilled other conditions as prescribed for driving particular groups or types of vehicles.

Again, for security part, road users are distracted by some bad people whenever they use expressway. It is personal experience and not exaggerating at all

that my car's window was thrown a stone by unknown bad people near 120 miles when collecting survey data on expressway. Therefore, government should provide and support more to expressway police force in order not to happen such kind of crimes anymore.

To sum up, the government should review more strict regulation regarding the drivers' behaviour and improve the conditions of police force, law enforcement of road accidents. In addition, government should provide and maintain modern equipment wide spread to take records and serious actions on the violation of traffic rules and regulations on expressway. In order to produce positive road safety outcomes, strong management in all aspects of road safety is required. This means that the full range of solutions, improving road facilities and infrastructure, traffic and speed management, vehicles standards and equipment and road users' and drivers' behaviour need to be addressed. Therefore, this research may be beneficial to the relevant traffic accident problems and their main causes especially on expressway to consider the safety improvements, either strategies or practices.

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APPENDIX - I

Section 1 – Personal data and experiences on expressway of respondent

1. Age – ( ) years
2. Gender

☐ Male ☐ Female

3. Education Level

☐ Middle School ☐ High School ☐ University Student ☐ Graduate

4. Type of license

☐ B ☐ D ☐ E

5. How long have you got driving license?

☐ Under 1 year ☐ Between 1-5 year ☐ Between 5-10 year ☐ Above 10 years

6. Do you start driving as soon as you have got a license?

☐ Yes ☐ No

7. If you answer 'No' in Question No. 6
   What is the time gap between that you have started driving and having license?

☐ Under 6 months ☐ Between 6months-1 year ☐ Above 1 year

8. How long have you been driving on Yangon-Mandalay expressway?

☐ Under 1 year or ( ) Year(s) ( )Month(s)

9. How many times have you driven on expressway? (estimate answer is accepted)

☐ Under 5 ☐ Between 5-10 ☐ Between 10-20 ☐ Above 20

10. Which type of vehicle do you drive on expressway most frequently?

☐ Private and rental car ☐ Light truck ☐ Express or Mini Bus

11. If you drive private and, or rental car, which type of car do you drive? (Can tick more than one answer)

☐ Saloon type (Mark II, Crown, Ciaz) ☐ SUV (CRV, RAV-4, X-Trail)
☐ Private small car (Fit,Vitz, Demio) ☐ Light truck (Town-ace, Bongo)
☐ Van, Station Wagon (Caldina, AD van) ☐ Mini pick-up (Suzuki pick-up, Hijet)
☐ 8-15 seater van (Alphard, Hi-ace)

12. If you drive express, which type of car do you drive?

☐ Express Bus (45 seater express) ☐ Mini bus (20-35 seater bus)

☐ Hi-ace (8-15 seater van)

13. Your regular driving speed on expressway

☐ 80 km/h and under ☐ Between 100-120 km/h

☐ Between 80-100 km/h ☐ 120 km/hs and above

14. Have you ever felt sleepy while driving on expressway?

☐ Yes ☐ No

15. How have you solved it? (Can tick more than one answer)

☐ Stopping aside the expressway and sleep for a while as soon as feeling sleepy

☐ Talking with partner not to feel sleepy

☐ Driving to the nearest rest terminal and sleep there

☐ Opening a song and keep driving

☐ Drinking energy drinks or eating lemon flakes to feel active

☐ Swapping role with partner

16. Are you driving on expressway with partner or not?

☐ Driving only with partner ☐ Driving alone

17. Before driving on expressway, do you have the habit of checking your car?

☐ Always ☐ Sometimes ☐ Never

18. Do you think that there should be more traffic signs and road marking on expressway?

☐ Yes ☐ No

19. Do you think that it is hard to see the road interchange or intersections in advance at night as there is no enough street lights and reflection signs?

☐ Yes ☐ No

20. Do you know the respective speed limit for each type of vehicle?

☐ Yes ☐ No

21. Which part of expressway is hard to drive in your opinion? (can tick more than one answer)

- ☐ From Yangon toll gate to 39 mile rest camp
- ☐ From 39 mile rest camp to 115 mile rest camp
- ☐ From 115 mile rest camp to Nay Pyi Taw toll gate
- ☐ From Nay Pyi taw toll gate to 285 mile rest camp
- ☐ From 285 mile rest camp to 366 Ta Kon Tine round about

22. Things annoys you on expressways - (can tick more than one answer)

☐ Motorbike ☐ Sudden pedestrian ☐ Cart ☐ Animals (Dog, Cow, Goat)

☐ Cars do not stop aside

23. Have you experienced any accidents on expressway?

☐ Yes ☐ No

24. The top three priority facts that you suggest in order to be safe and free from accidents

☐ Checking the car's conditions ☐ Not drinking beer and alcohol while driving

☐ Not driving more that limited speed ☐ Control not to be sleepy

☐ Wearing seatbelt

25. Do you think the rest camps on expressway are pretty far from one another?

☐ Yes ☐ No

26. Do you think that expressway is still needed to upgrade a lot?

☐ Yes ☐ No

27. Feel free to express what facts are needed to upgrade about expressway (not compulsory)

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Section 2- Questions in term of driver's awareness while driving on expressway

Degree

1 - Strongly Disagree 2 - Disagree 3 - Natural

4 - Agree 5 - Strongly Agree

		1	**2**	**3**	**4**	**5**
Sr.	Description	Strongly Disagree	Disagree	Natural	Agree	Strongly Agree
1.	Over speed driving on expressway can increase the traffic accidents.					
2.	Speed limitation for some type of vehicles is too low and which are likely to make the driver feel bored and sleepy.					
3.	It should be take more serious actions on over speed driving than before.					
4.	As if there will be as long as careful and full concentration on driving, over speed driving doesn't matter at all.					
5.	Driving too close with front cars doesn't feel dangerous while you are driving on expressway.					
6.	Over taking at road bend and bridges on expressway is dangerous.					
7.	Driving non-stop on expressway is more likely to happen accidents.					
8.	Overloading while driving on expressway is not dangerous at all.					
9.	It should be better t reduce speed during bad weather like raining heavily or foggy are happened when driving on expressway.					
10.	It should be more careful and give more attention when driving at night than daytime.					
11.	It is not acceptable to practice drink driving on expressway.					
12.	Using mobile phone while driving is dangerous.					
13.	Using mobile phone on expressway if traffic is clear, it is not dangerous at all.					
14.	Wearing seatbelt before driving is a good habit.					
15.	Wearing seatbelt can reduce the death of driver and passengers if there was an accident.					
16.	It isn't necessary to wear seatbelt if you drive carefully.					
17.	It should give attention on traffic signs along expressway while driving.					

Section 3- Questions in term of driver's behavior while driving on expressway

		1	2	3	4	5
Sr.	**Description**	**Strongly Disagree**	**Disagree**	**Natural**	**Agree**	**Strongly Agree**
1.	Sometimes, I drive more than speed limitation					
2.	It is hard to follow all limited speeds on expressways always					
3.	As the speed test meter cannot be seen in advance, I probably drive more than limited speed.					
4.	I am a safe and careful driver though driving over speed					
5.	I follow too close to front car often on expressway					
6.	If traffic on expressway is clear, I do over taking at bridges and bending parts of expressway					
7.	I rarely take break while driving on expressway					
8.	I practice overloading while driving on expressway					
9.	I do not reduce speed if the weather condition was getting worse					
10.	While driving at nighttime, I put front light down if back car tries to do over taking					
11.	I always drive carefully on unexpected sudden things like people, animal or slow vehicles on expressway					
12.	I feel annoyed if there are slow vehicles such as bicycles and motorbikes which do not have no reflection or front and back light					
13.	I feel annoyed due to unskillful drivers on expressway					
14.	Sometimes, I take alcohol a bit while driving on expressway					
15.	I sometime use mobile while driving					
16.	I strongly believe that I can drive safely though using mobile when driving					
17.	I always wearing seatbelt					
18.	I always warning passengers to wear seatbelt while driving on expressway					
19.	I do not feel safe if I do not wear seatbelt					

- To express the difficulties of driving on expressway if there was

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- Additional comment relating to current expressway system

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Thank you very much for your active participation

APPENDIX - II

THE MAP OF YANGON - MANDALAY EXPRESSWAY

APPENDIX - III

YANGON - MANDALAY EXPRESSWAY

APPENDIX - IV

SPEED LIMITATION CHART

ON YANGON-MANDALAY EXPRESSWAY